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ERRATA

Page	26	line 7	for 'Kargopolova'	read 'Kargapolova'
	158	10	after 'scurf' insert 'of potato'	
	160	49	for 'gumming disease'	read 'gomziekte [leaf scald]'
	176	lines 36 and 40	for '*Dactyella*'	„ '*Dactylella*'
	220	line 35	for 'Ayres'	„ 'Ayers'
	231	11	„ '497'	„ '479'
	232	20	„ '*Cunninghamiella*'	„ '*Cunninghamella*'
	241	42	„ '1936'	„ '1937'
	249	25	„ 'of the'	„ 'to the'
	298	49	„ '*ehrenbergii*'	„ '*ehrenbergi*'
	302	26	„ '42'	„ '427'
	325	47	insert '?' before '*Lambertella*'	
	350	lines 2 and 5	for 'spruce'	read 'silver fir'
		line 3	„ 'firs'	„ 'spruces'
	353	lines 2 and 7	„ 'fir'	„ 'spruce'
	366	lines 7 and 10	„ 'copper'	„ 'iron'
	377	line 28	for '*relianum*'	„ '*reilianum*'
	381	27	„ 'Lee (L. R.)'	„ 'Lee (L. E.)'
	428	29	„ 'Findlay (W. K. P.)'	„ 'Findlay (W. P. K.)'
	453	41	„ 'hyphae'	„ 'strands'
	477	41	„ 'Davies (F. A.)'	„ 'Davies (F. R.)'
	492	20	„ 'Cummins (J. B.)'	„ 'Cummins (G. B.)'
	495	45	„ 'xv'	„ 'xiv'
	546	48	„ '*oliviae*'	„ '*olivae*'
	566	46	„ 'Trotter (H.)'	„ 'Trotter (A.)'
	570	40	„ 'Yuasa (K.)'	„ 'Yuasa (A.)'
	595	30	„ '1936'	„ '1937'
	599	lines 2 and 5	for 'millet'	„ 'maize'
	627	line 9	for 'Ainsworth (C. G.)'	„ 'Ainsworth (G. C.)'
	629	21	„ 'Van der Plank (J. C.)'	„ 'Van der Plank (J. E.)'
	637	16	„ '*aroidea*'	„ '*aroideae*'
	660	25	„ 'they'	„ 'the pods'
	676	45	„ 'to'	„ 'by'
	689	13	„ 'Shear (J. M.)'	„ 'Shear (G. M.)'
	720	46	delete '(Gilbert and Ellice)'	
	754	lines 28–29	for '*Botrytis cinerea*, and *Aplanobacter insidiosum* [ibid., xv, p. 586];'	read 'and *Botrytis cinerea*; *Aplanobacter insidiosum* [ibid., xv, p. 586] and
		line 30	for 'occurs'	read 'occur'
		lines 35–37	delete '*A. insidiosum* . . . sainfoin'	
	776	line 31	for 'Cummins (C. B.)'	read 'Cummins (G. B.)'
	782	30	„ 'isolated from'	„ 'found on'
	813	31	„ '*obtusispora*'	„ '*obtusisporum*'

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TAI (F. L.). **A list of fungi hitherto known from China.**—*Sci. Rep. Tsing-Hua Univ.*, Ser. B, ii, 2, pp. 137–167, 1936.

Among the items in this annotated list of 102 Chinese Phycomycetes (representing the first part of a complete list of all fungi recorded from China) are *Olpidium nematodeae* Skvortzow on a nematode in northern Manchuria (*Arch. Protistenk.*, lvii, p. 204, 1927) and *Synchytrium dolichi* on *Dolichos lablab* [*R.A.M.*, viii, p. 406]. The paper is preceded by an introductory note on noteworthy collectors of Chinese fungi [cf. ibid., xv, p. 683], together with a bibliography of the relevant literature comprising 175 titles.

SUBBA RAO (M. K.). **Report of the Mycologist.**—*Adm. Rep. Tea sci. Dep. Unit. Plant. Ass. S. India, 1935–36*, pp. 46–54, 1936.

During the period under review leaf disease of tea (*Cercosporella theae*) [*R.A.M.*, xiii, p. 216] was recorded for the first time in southern India from the High Range but its precise status is not yet known. No differences were observed between the author's strain of *C. theae* and one obtained from Ceylon. Spraying, regarded as impracticable on a large scale, is tentatively recommended to prevent the spread of the disease, while affected leaves and twigs should be burnt.

Tea leaves affected with sooty mould showed, in most instances, the presence of a *Capnodium*. Pink disease (*Corticium salmonicolor*) was commonly present and brown blight [*Glomerella cingulata*: ibid., xv, p. 748] frequently affected nursery tea seedlings. Velvet blight, probably caused by *Septobasidium theae* [ibid., x, p. 557], occurred on one estate, and a suspected case of canker (*Macrophoma theicola*) [ibid., xiii, p. 541] on another. Violet root rot (*Sphaerostilbe repens*) [ibid., xv, p. 748] was observed for the first time in southern India.

Soil applications of sulphur against witches' broom of tea [ibid., xiii, p. 541] have not given entirely satisfactory results, and the treatment requires further consideration. Tea seedlings grown in water culture solutions without sulphur developed brown and flaccid roots and tip-burn of the leaves, which withered and finally dropped off, in contrast with the normal growth in the plus sulphur series.

A die-back of dadap [*Erythrina lithosperma*] was associated with a *Fusarium* [ibid., x, p. 80]. *Grevillea* [*robusta*] was attacked by red root rot [*Poria hypolateritia*: ibid., xv, p. 747], which also affected tea bushes growing in the vicinity. Tung oil trees (*Aleurites* spp.) showed

a leaf disease due to a *Pestalozzia*, and one tree was affected by pink disease [*C. salmonicolor*].

GULYÁS (A.). **A magyar Dohányok virus-betegségei.** [On the virus diseases of Hungarian Tobacco.]—*Rep. Hung. agric. Exp. Sta.*, xxxix, 1–3, pp. 1–34, 9 pl., 1936. [German and French summaries.]

Certain varieties of tobacco commonly grown in Hungary, e.g., 'Debrečen' and 'Szulok', are said to be very susceptible to virus diseases, of which the following types are amongst the most prevalent in the country. 'Mosaïque marmorée' [marbled mosaic] is characterized by the development on the leaves of yellowish-green or yellow spots, but is not very dangerous, since a dry and warm climate, like that of Hungary, is unfavourable to it. Ring spot [*R.A.M.*, xv, p. 831] is widespread; three different forms are recognized, two of which cause considerable damage in certain areas, especially in the neighbourhood of Debrečen; the third is of a rarer occurrence and only affects Havana tobacco. Veinbanding [loc. cit.] of Hungarian tobacco completely destroys the leaves but only occurs on soils with a high nitrogen content. Vein necrosis [cf. ibid., ix, p. 626] is dangerous because it kills the plant, but only occurs rarely. 'Debrečen' tobacco is frequently attacked by a disease known under a name equivalent to 'vein whiteness'; this disease has often been confused with damage caused by *Thrips* spp., but has now been shown to be due to a virus. Yellow mosaic [ibid., xv, p. 614] is frequent on 'Szulok' tobacco in the Transdanubian provinces. Spot necrosis [loc. cit.] is occasionally found in association with vein necrosis, but only on the main stem of the tobacco plant.

[HOPKINS (J. C. F.).] **Mycological notes. Epidemic wildfire and angular spot in Tobacco.**—*Rhod. agric. J.*, xxxiii, 7, pp. 479–481, 1936.

In discussing Clayton's recent work on the relation between epidemic outbreaks of tobacco wildfire (*Bacterium tabacum*) and water-soaking of the leaves [*R.A.M.*, xv, pp. 537, 687], the author states that in Rhodesia leaves are frequently turned over by high winds so that the under surface is exposed to rain, and often show large water-soaked areas after thunderstorms. Furthermore, low topping and high-nitrogen fertilizing factors found by Clayton to facilitate water-soaking, are not uncommon in Rhodesia. Wildfire is regarded as a potential menace to the local industry, held in check only by the frequent dry spells occurring during the growing season.

It has been observed in a number of cases in the Colony that similar conditions obtain with regard to angular leaf spot [*Bact. angulatum*: ibid., xv, p. 613], though the differences between the symptoms of the epidemic and the 'static' phases are less pronounced than with wildfire.

KALASHNIKOFF (K. J.). Закономерности развития **Cladosporium fulvum Cooke.** [The bio-ecology of *Cladosporium fulvum* Cooke.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 70–71, 1936.

The results of a series of experiments conducted since the very recent discovery of tomato leaf mould (*Cladosporium fulvum*)

[*R.A.M.*, xv, p. 690] in the U.S.S.R. have shown that the optimum temperatures for spore germination and growth of the fungus are 20° to 26° C., and for host infection 24° to 25°. Preliminary results indicated that in the initial stages the development of the disease may be retarded by underground irrigation of the tomato beds in glasshouses, the yield in which was more than doubled by this measure, as compared with that in houses watered from above [cf. ibid., ix, p. 349].

HEIM (R.). **Les champignons destructeurs des charpentes d'habitation.** [Fungi destructive of constructional timber.]—*Rev. Mycologie*, N.S., i, 3, *Suppl.* pp. 8–11, 4 figs., 1936.

In this preliminary paper the author divides the fungal rots of constructional timber first into four classes, viz. fibrous, lamellated, fragmented or parallelepipedal, and alveolar or nodular, exemplified, respectively, by the rots caused by *Phellinus* [*Fomes*] *cryptarum* [see next abstract]; *Poria* [*Trametes*] *sinuosa* [*R.A.M.*, viii, p. 3] and *Gloeocystidium insidiosum* Bourd. & Galz.; *Merulius lacrymans* and *Trametes vaporaria* [ibid., iv, p. 250]; and *Stereum frustulosum* [ibid., xii, pp. 669, 795] and *Xanthochrous* [*Trametes* or *Fomes*] *pini* [ibid., xv, p. 694]. He then further classifies them as blue (caused especially by *Ceratostomella*), green (*Chlorosplenium aeruginosum*), red (exotic Polypores, notably *Porogramme*), yellow (*Merulius* spp.) and black (*Armillaria mellea*) rots. In attempting to identify a timber rot the condition must first be placed in one of each of these two classes, identification of the causal organism by the fruit body, hyphae, rhizomorphs, and xylostroma being the next step. In Europe the chief timber-rotting fungi number about 14, viz. *M. lacrymans*, which causes four-fifths of the damage to constructional timber in France, *Coniophora cerebella* [*C. puteana*: ibid., xv, p. 622 *et passim*] found chiefly in cellars, *F. cryptarum* common mostly in dark, badly ventilated places, *T. vaporaria* and *T. persoonii*, both of which require high humidity, *Poria medulla-panis* [ibid., ix, p. 78], which produces a rapid rot of piles and processed timber, and *P. megalopora*, a serious agent of destruction in well-aerated, damp situations, on shutters, bridges, &c., *S. frustulosum*, which causes a slow, interior, outwardly invisible rot of oak beams, *Lenzites abietina* [ibid., xiv, p. 412] and *L. sepiaria* [ibid., xv, pp. 332, 761] which chiefly attack pine and spruce posts in mines, *Paxillus panuoides* [ibid., xv, p. 186], found in mines, cellars, and ice-houses, and *Schizophyllum commune* [ibid., xiv, p. 270], common but not very serious on mine posts. In addition, *Stereum purpureum* [ibid., xv, p. 676] occurs on beech in sawmills, and *Ungulina annosa* [*Fomes annosus*] on standing pine trees.

CARTWRIGHT (K. ST. G.) & FINDLAY (W. P. K.). **The principal rots of English Oak.**—v+38 pp., 13 pl., 2 figs., London, H.M. Stationery Office, 1936. Price 2*s*.

A brief description is given of the gross and cultural characters, economic importance, and control of the principal fungal rots of standing and felled oak [*R.A.M.*, xii, p. 795] in England. Experiments made to ascertain the relative resistance to fungal attack of oak sapwood and heartwood showed the average loss of weight of the former after 8

months to be 39·3 per cent. and of the latter 6·8 per cent. The rots of standing oak dealt with include brown cubical rot (*Polyporus sulphureus*) [ibid., xiv, p. 795], brown oak (*Fistulina hepatica*) [ibid., xiv, p. 663], white butt rot (*P. dryadeus*) [ibid., xiii, p. 664], piped rot (*Stereum gausapatum* Fr.) [ibid., xiv, p. 810], 'partridge wood' (*S. frustulosum*) [see preceding abstract] and the minor rots, *Ganoderma applanatum* and *G. resinaceum*. 'Partridge wood' first shows as a dark brown discoloration, in the midst of which variously sized, irregularly distributed white patches appear, in which the elements of the wood disintegrate, leaving spindle-shaped holes. These holes are lined with white mycelium; they gradually enlarge but never coalesce, remaining separated by thin sheets of dark, firm wood.

The rots of felled oak discussed include *Daedalea quercina* [ibid., xiii, p. 137], white sap rot (*S. hirsutum*) [ibid., xiii, p. 334], *Bulgaria polymorpha* [ibid., xi, p. 612], *Irpex obliquus*, *Polystictus versicolor* [ibid., xv, p. 621], *Polyporus adustus* [ibid., xi, p. 684; xii, p. 343], *Lentinus tigrinus* [ibid., xv, p. 471], and *Fomes ferruginosus*; an account is also given of dry rot (*Merulius lacrymans*) and the serious decay caused in the oak timbers of buildings by the fungus provisionally named *Phellinus cryptarum* Karst. [ibid., xiv, p. 136; xv, pp. 186, 622], a fungus in no way related to that known as *F. cryptarum* Bull. by German authors nor to that recorded by Rea (British Basidiomycetae, 1922) as *Polyporus cryptarum* (Bull.) Fr. which appears to be closely related to *P. benzoinus*; Bourdot is stated to consider it identical with *Poria megalopora* [see preceding abstract], though the fructification is definitely of the *Fomes* type.

The work concludes with notes on chemical stain of oak wood caused by the action of iron on the tannin, golden oak (*Eidamia catenulata*) [ibid., iii, p. 489], yellow stain caused by a fungus of the *Penicillium divaricatum* [*Paecilomyces varioti*] group [ibid., xiv, p. 663], and grey stain (*Ceratostomella quercus*) [ibid., xiv, p. 274].

Delécluse (R.). **Quelques champignons ennemis du Chêne-liège au Maroc.** [Some fungal enemies of the Cork Oak in Morocco.]—*Rev. Path. vég.*, xxiii, 3, pp. 244–257, 4 figs., 1936.

Brief, popular notes are given on 37 fungal species found on cork oaks [*Quercus suber*] in Morocco, including *Auricularia mesenterica* (a prevalent and dangerous parasite); *Vuilleminia* [*Corticium*] *comedens* [*R.A.M.*, iii, pp. 72, 438], causing important losses in stacked timber; *Stereum gausapatum* [see preceding abstract], which may cause appreciable damage; *S. hirsutum*, which is very common, and causes a very active rot; *S. spadiceum* Pers. [ibid., xiv, p. 810], *Coriolus* [*Polystictus*] *pergamenus* [ibid., xv, p. 410], *C.* [*P.*] *versicolor*, *Ungulina fomentaria* [*Fomes fomentarius*: ibid., xv, p. 330] (rare in Morocco), *Xanthocrous* [*P.*] *cuticularis*, *Armillariella* [*Armillaria*] *mellea*, and *Schizophyllum commune*.

Armstrong (F. H.). **The mechanical properties of 'black heart' Ash wood (Fraxinus excelsior, L.).**—*Quart. J. For.*, xxx, 3, pp. 202–210, 6 graphs, 1936.

The discoloration of the heartwood of English ash (*Fraxinus ex-*

celsior) known as 'black heart' varies from light to very dark brown, and is generally present in the butt log, extending in many cases for a considerable distance up the tree. The author points out that the origin and cause of the condition are doubtful, and describes a series of tests made to determine the effect of the discoloration on the mechanical properties of the timber. The results obtained [which are expressed graphically and fully discussed] showed that the discoloured wood is not inferior to normal ash in bending or compressive strength, hardness, or toughness and no differences in the types of fracture for normal and black heart ash were observed.

FERRARIS (T.). **Seccume primaverile dei germogli di Pioppo canadese.** [Spring wilt of the shoots of Canadian Poplar.]—*Riv. agric., Roma*, xxxii, 736, p. 223, 1936.

A detailed description is given of the epidemic occurrence of leaf fall (*Venturia tremulae*) [*R.A.M.*, xv, pp. 328, 618] of Canadian poplars [*Populus canadensis*] in Italy in the spring of 1935.

Control measures recommended consist in spraying young trees and nursery stock with 1 per cent. cupric mixtures, in plant sanitation, and in the use of the immune hybrid 'Arnaldo Mussolini' and the resistant *P. carolinensis* and *P. virginiana*.

FRESA (R.). **Argentine Republic: Melampsora larici-populina in the Delta of Paraná.**—*Int. Bull. Pl. Prot.*, x, 7, pp. 145–146, 1936.

Poplar rust (*Melampsora larici-populina*) [*R.A.M.*, xv, p. 618] is reported to have developed with great intensity on *Populus nigra* var. *italica* in the Delta of Paraná, this being the first record of its occurrence in the Argentine. The degree of infection was observed to vary with local environmental conditions; in severe cases complete defoliation of the trees resulted from the attacks of the rust, commonly associated with which were *Septoria populi* [ibid., xiv, p. 15], *Cercospora populina*, *Sphaceloma populi*, and a *Dothichiza* resembling *D. populea* [ibid., xv, p. 471], all in a serious form, while a *Phyllosticta* was also found on the leaves.

GOIDÀNICH (G.). **Le alterazioni cromatiche parassitarie del legname in Italia. III. Colorazione rosa del legno di Pioppo causata da 'Fusarium javanicum' Kds.** [Parasitic staining of timber in Italy. III. A red discoloration of Poplar wood caused by *Fusarium javanicum* Kds.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 1, pp. 65–68, 1 fig., 1936.

In 1935 the author isolated *Fusarium javanicum* [*R.A.M.*, v, p. 125] (stated to be the first record of this fungus in Europe) from the trunk of a *Populus canadensis* tree growing near Rome. The fungus caused a violaceous-red or lilac discoloration of varying intensity, most conspicuous near the periphery of the trunk, and gradually shading off into the healthy parts. Hyphae were noted in the cells of the parenchyma and medullary rays and inside the vessels. The anatomical structure of the discoloured tissues remained unaffected and the infection did not appear to cause serious damage.

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes. VII.**—*Pap. Mich. Acad. Sci.*, xxi, pp. 243–267, 10 pl., 1936.

In this further paper, describing his studies of twelve resupinate Polypores of the Great Lakes [*R.A.M.*, xiv, p. 805] the author states that *Poria xantha* [ibid., viii, p. 3] (reported by Blair to attack mill roofs: *Phytopathology*, ix, p. 54, 1919; x, p. 61, 1920) was found to be common on conifers in the north-western forests, occurring frequently on charred logs and stumps.

P. ambigua was observed to be common throughout hardwood forests and especially on land liable to flooding. The species has been reported from California [under the name of *P. vaporaria*: see Fawcett: Citrus diseases, p. 149: *R.A.M.*, xv, p. 574] as a secondary pathogen of citrus roots, breaking down and rotting the bark and wood of the roots killed by waterlogging or injured by other organisms. It is pointed out that *P. vaporaria* Fr. sensu Burt is totally distinct from the true *P. vaporaria* as interpreted in Sweden and by the present author.

Trametes heteromorpha is found abundantly in the forests of north-western America and also occurs on railway sleepers and other structural timbers, frequently causing serious damage.

ROBAK (H.). **Notes on Norwegian wood rots. I. Notes on Stereum sanguinolentum A. & S. and red heart rot in living conifers. II. The genus Coniophora DC. and the 'vaporarius' rot in conifers.**—Reprinted from *Nyt Mag. Vidensk.*, lxxvi, 4 pp., 1936.

From a sample of *Picea excelsa* showing a characteristic reddish-brown rot of the heart wood, the writer in 1934 isolated in pure culture a mycelium with all the typical features of *Stereum sanguinolentum* [*R.A.M.*, xiv, p. 803], of which this is believed to be the first record for Norway.

A brown, cubical butt rot of pine and spruce in northern Europe has commonly been attributed, in the absence of fruit bodies, to *Polyporus vaporarius* [*Poria vaporaria*] or *Polyporus borealis* [loc. cit. and ibid., xv, p. 411], but the fungus isolated from a rot of this type on spruce appears, from the mode of branching of the brownish-grey to blackish mycelium and the verticillate arrangement of the clamp-connexions, to be a species of *Coniophora*. The rôle of a *Coniophora* infecting balsam firs [*Abies balsamea*] in association with *P. balsameus* [ibid., viii, p. 412] in Canada was held by Clara W. Fritz (*Proc. roy. Soc. Can.*, Sect. v, 1923) to be secondary, and such may also be the case in Norway, although in the writer's opinion this is improbable.

ROBAK (H.). **Studies in the biology of wood-destroying Hymenomycetes. I. Contribution to the knowledge of homothally and heterothally in some species of Thelephoraceae and Polyporaceae. II. The ability of haploid mycelia to produce rot.**—Reprinted from *Nyt Mag. Vidensk.*, lxxvi, 15 pp., 3 diags., 1936.

Monospore mycelia of seven species of Thelephoraceae and Polyporaceae (obtained from sporophores in the vicinity of Oslo, Norway,

unless otherwise stated) were cultured singly and in combination. Fully developed clamp-connexions were regularly produced by *Stereum sanguinolentum* [see preceding abstract] from pine (*Pinus sylvestris*) and spruce (*Picea excelsa*) (Oslo) and from the latter host in western Norway, and by *S. rugosum* [*R.A.M.*, xiii, p. 810] from alder (*Alnus glutinosa*), and these two species may therefore be regarded as homothallic. The remaining species, viz., *Corticium evolvens* [ibid., iv, p. 453] from stored spruce logs, *S. purpureum* from spruce timber and living Norway maple (*Acer platanoides*), *Lenzites sepiaria* [see above, p. 3], *Polystictus abietinus* [ibid., xii, p. 343], and *Trametes serialis*, all from spruce (the last-named originating near Stockholm, Sweden), did not form clamp-connexions. In cultures representing every possible combination of mycelia from a single sporophore, *L. sepiaria* and *T. serialis* followed, with certain irregularities, the scheme of bipolar sexual differentiation, while *S. purpureum*, *P. abietinus*, and probably *C. evolvens* pursued the tetrapolar course.

Monospore mycelia of *C. evolvens*, *S. purpureum*, *P. abietinus*, and *T. serialis* were found to develop very satisfactorily on spruce and pine blocks, and in the case of the two last-named decay was quite as extensive in the samples inoculated with monospore cultures as in those treated with polyspore material. *T. serialis* in particular was responsible for a considerable loss of weight in the inoculated wood. Neither *C. evolvens* nor *S. purpureum* induced any perceptible symptoms of rot during the six months covered by the tests.

Hirt (R. R.). **The progress of blister rust in northern White Pine.**—*J. For.*, xxxiv, 5, pp. 506–511, 1 graph, 1936.

The results of investigations from 1928 to 1935 at Warrensburg, New York, indicated that though only a comparatively small percentage of aecidiospores of *Cronartium ribicola* is produced by blister rust-infected white pines (*Pinus strobus*) [*R.A.M.*, xv, p. 412] in newly established plantings, such production continues for a number of years after attack and may serve to intensify the activity of the rust in the presence of *Ribes*. In this connexion the writer insists on the need for systematic inspections and re-eradication of the alternate hosts of *C. ribicola* in and near young white pine plantings in regions of known blister rust infestation. Some diseased individuals may survive an attack of rust, but such trees are generally so badly damaged that they cannot be expected to yield commercially valuable timber. The fungus has been observed to persist for at least eight years in newly established plantings exposed to rust infection at the outset but subsequently protected from further invasion. Each year some of the diseased trees die, so that eventually the planting should be free of the rust if an efficient system of exclusion is maintained.

Twenty-fifth Annual Report of the Conservation Department, State of New York, for the year 1935. Legislative Document (1936) No. 38.—500 pp., 76 figs., 1 diag., 3 graphs, 2 maps, 1936.

This report contains a number of references to the white pine blister rust [*Cronartium ribicola*: see preceding abstract] control campaign and other items of phytopathological interest in connexion with New

York silviculture. Figures are given indicating the scope of the work in various fields: e.g., on State Reforestation areas, 23,069 acres protected, 949,177 *Ribes* destroyed; on private land, 242,259 and 4,711,621, respectively. A re-examination was made during the year of a series of 'damage study' plots established from 1923 to 1928 in four counties. In one such plot, consisting of 25- to 30-year-old white pines, there are still 230 healthy trees notwithstanding 43 per cent. mortality from blister rust. No doubt the *R. nigrum* eradication in 1928 contributed largely to this favourable result, but in any case the extent of the injury caused by the disease under natural conditions is extremely variable and dependent on a number of silvicultural factors.

One of the two organisms associated with resinosis of white and red pines [*Pinus strobus* and *P. resinosa*] is *Polyporus schweinitzii* [*R.A.M.*, xiv, p. 803]. There are some indications that the spread of infection is gradually declining in the most severely diseased plantations in the Rochester district, but not before some 50 to 65 per cent. of the trees have been destroyed. Predisposition to resinosis appears to be definitely connected with the heavy, somewhat alkaline soils in the area under observation and does not assert itself until the trees are over ten years old. Scots pine [*P. sylvestris*] seems to be immune from the disease and its extended cultivation in the affected area is therefore recommended.

All the epidemic infections (up to 75 per cent.) of red pines by *Tympanis pinastri* [ibid., xiv, p. 612] occurred in plantings over 18 years old. The fungus enters the trees through branches that have been 'shaded out' during the closing in of the plantation. Most of the plantings examined had a density of over 1,200 trees per acre and had been neither thinned nor pruned. Infection was most severe on the more alkaline soil types.

Quick (C. R.). **Chemical control of harmful fungi during stratification and germination of seeds of Ribes roezli.**—*Phytopathology*, xxvi, 7, pp. 694–697, 1936.

Full details are given of a series of tests on the control of [unspecified] damping-off fungi in the propagating medium (consisting of equal parts of river sand, fine forest loam, and sphagnum moss) used for the stratification and germination of *Ribes roezli* seeds in connexion with an investigation on the chemical eradication of *Ribes*. Good protection to seeds and seedlings was afforded by finely powdered cupric oxalate at the rate of 6 to 10 gm. per sq. ft. of soil surface. Satisfactory results were also given by basic cupric carbonate (4 to 8 gm. per sq. ft.), which was, however, slightly less efficacious than the foregoing. A number of other seeds, including other *Ribes*, snapdragon [*Antirrhinum majus*], and *Petunia*, have also been successfully treated by these compounds. Fairly good control was further given by 70 per cent. nitric acid (1 to 250) and 40 per cent. formaldehyde (1 to 750), but these methods of treatment were not quite so reliable as the dusts.

Burbidge (Nancy T.). **Root development in Pinus pinaster and the seasonal variation of its mycorrhizae.**—*Aust. For. J.*, i, 1, pp. 33–40, 1 diag., 1 graph, 1936.

The root systems of *Pinus pinaster* at the Western Australian Forest

Department's plantation at Applecross were excavated at the seedling stage and again after the first, second, and third years in the field. Mycorrhiza were present on all parts of the root system [*R.A.M.*, xiv, p. 410] in nursery plants, on the laterals and sublaterals in those of the first year, on the ends of the laterals and on the sublaterals after the second year, and on the sublaterals only after the third. They must therefore be ephemeral structures, rarely persisting for more than one season. The growth activities of both roots and mycorrhiza were found to be closely correlated with an abundance of moisture in the soil.

Rohde (T.). **Eine neue Krankheit der Sitkafichte in Deutschland.** [A new disease of the Sitka Spruce in Germany.]—*Z. PflKrankh.*, xlvi, 6, pp. 277–284, 8 figs., 1936.

The writer describes the results of his recent investigations on a hitherto unreported disease of the Sitka spruce [*Picea sitchensis*] in the Lower Rhine and Hanover. On the stem the disturbance assumes the form of irregular dead ('bald') patches, measuring 2 by less than 1 cm. and upwards, and conspicuous only on the young wood where needles are normally plentiful. In severe cases the cortex exudes white resin through longitudinal fissures revealing the dry surface of the xylem, while the stem may be girdled and the whole upper portion killed. The small lateral branches are more or less extensively desiccated and devoid of needles, and the diseased portions of the cortex and cambium are brown and discoloured. The outermost layer of the lesions was uniformly constituted by the wood formed in 1934, so that the die-back must have preceded the incremental growth of 1935. The examination of a ten-year-old planting, with Sitka spruces predominating, showed that only 70 to 80 per cent. of the stand was entirely free from injury, the extent of which on the diseased trees ranged from slight damage on the branches to the death of the upper half of up to $\frac{1}{6}$ of the total number of stems.

The apothecia of a Discomycete, to be described by Prof. Kirschstein in a forthcoming number of *Ann. mycol., Berl.*, as *Pezizula rohdeana* n. sp., were found in abundance on the cortical lesions, but the part played by the fungus in the etiology of the disease—which is definitely of a parasitic character—remains to be investigated. The external symptoms are reminiscent of those associated with *Phoma*, *Phomopsis*, and *Nectria cucurbitula* [*R.A.M.*, vi, p. 683], but in no case could the fruit bodies of these organisms be detected.

Bunce (S. C.). **The preservation of fencing materials.**—*J. S.-E. agric. Coll., Wye*, xxxviii, pp. 150–152, 5 pl., 1 fig., 1936.

In tests on the preservation of fencing timber with creosote the quickest and best results were obtained by boiling for a period of 6 to 8 hours and then allowing the wood to cool in the creosote for 12 to 24 hours. Complete impregnation resulted from boiling for 12 hours, followed by cooling in the creosote. The cost of creosoting a 6 by 6 in. gate-post to a distance of 3 ft. from the base amounted to approximately one shilling, and the length of life was increased by 50 to 100 per cent.

Chipp (W. F.). **The utilization of the open tank process for the preservative treatment of sleepers in Malaya.**—*Malay. Forester*, vi, 3, pp. 95–99, 3 figs., 1 diag., 1936.

Full technical and economic details are given of the working of an open-tank plant, subsidized by the Government of Johore, for the impregnation of railway sleepers of *Koompassia malaccensis* wood with a mixture of creosote and Diesel oils in equal parts [*R.A.M.*, xiv, p. 484].

Fedorintschik (N. S.). Основные закономерности биологии Капустной килы (**Plasmodiophora brassicae Wor.**). [Life-history of club root of Cabbage (*Plasmodiophora brassicae* Wor.).]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 69–70, 1936.

Recent investigations by the author have shown that the zoospore of *Plasmodiophora brassicae* [*R.A.M.*, xi, p. 16; xiv, p. 206; xv, p. 324] after entering a root hair of a cruciferous host immediately becomes a myxamoeba which, after repeated division of the nuclei, is transformed into a plasmodium containing up to 100 nuclei and over [cf. ibid., x, p. 3]; the plasmodium very soon breaks up into small uninuclear masses, each of which develops a wall and undergoes reduction division, resulting in the production of a large number of zoosporangia with four or eight zoospores each. The zoospores from the mature zoosporangia (inside the root hair) migrate into the tissues of the roots, where they are transformed into myxamoebae which multiply by budding; when the cell contents are exhausted the myxamoebae begin to fuse together and after this transitional and probably sexual phase form plasmodia. The plasmodium immediately undergoes reduction division and then breaks up into uninuclear portions which are gradually transformed into spores. The subsequent invasion of the root tissues is effected by division of the host cells but not by active migration of the parasite. The development of club root tumours is due to the intense multiplication of the myxamoebae by budding.

Kaufmann (O.). **Eine gefährliche Viruskrankheit an Rübsen, Raps und Kohlrüben.** [A dangerous virus disease of Rape, Colza, and Kohlrabi.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 4, pp. 605–623, 10 figs., 1936.

After reviewing the recent literature on the virus diseases of cruciferous plants, the author describes a disease of this type on winter-sown rape (*Brassica rapa oleifera*) [cf. *R.A.M.*, xv, p. 731], first observed in April, 1935, in Schleswig-Holstein, the main symptoms of which are an axial turning-over and curliness of the younger leaves, premature death of the older leaves and of whole plants before the end of the vegetative period, and severe chlorosis; mosaic patterns are not always present. Plants that have overwintered in the field may be very severely stunted, with a considerably thickened collar, and their leaves may show vein-clearing. In less severely diseased plants, the shoots are smaller, curved or geniculate, and frequently knotted. The diseased plants in the field most frequently occur in small nests of 3 or 4, but

also of as many as 30 plants. In large fields the edges and corners are usually more extensively infected than the middle portions. The disease was also found on rutabaga (*B. napobrassica*) and more rarely and in a lighter form on colza (*B. napus oleifera*). On these hosts, the leaves were not turned over, the most outstanding symptoms being a mosaic pattern and a heavy savoying of the foliage, which was further severely deformed and occasionally entirely killed by necrotic spots and tearing-up of the margins.

The virus was easily transmitted to healthy rape, colza, and rutabaga by sap inoculation and through the insect *Lygus pratensis* both in the greenhouse and in the field. While so far the disease has only caused significant losses to rutabaga, its easy transmission in the field renders it potentially very harmful.

Roland (G.). **Étude de la jaunisse de la Betterave.** [A study on Beet yellowing.]—*Rev. Path. vég.*, xxiii, 3, pp. 184–207, 6 figs., 1 graph, 1936.

This account of the author's detailed studies on virus yellows (yellowing) of beets is a shorter version of a series of papers already noticed from another source [*R.A.M.*, xv, p. 548].

Crown rot in Sugar-Beet.—*J. Dep. Agric. Irish Free St.*, xxxiv, 1, pp. 131–132, 1936.

In further experiments carried out in the Irish Free State on the control of heart rot of sugar beet [*R.A.M.*, xv, pp. 415, 764], at each of 25 centres three plots were given 14, 21, and 28 lb. per acre, respectively, of commercial granulated borax, a fourth plot being left untreated; the applications were made when the seed was sown or shortly after, and in no case after 21st June. To determine the effect of applying boron compounds to already affected crops, at each of 19 centres where the disease had already appeared one plot was dressed with borax at the rate of 28 lb. per acre between 16th July and 21st August, a further plot at 13 of these centres being dressed at the same time with an equivalent amount of borocalcite.

No heart rot developed at five centres, but even here borax applications in increasing quantities (up to 28 lb. per acre) produced corresponding increases in yield. Taking all the plots together where borax was applied at about sowing time the average yield per acre for the plots given dressings of 14, 21, and 28 lb. borax per acre were, respectively, 11 tons 6 cwt., 11 tons 16 cwt., and 12 tons 3 cwt., as compared with 8 tons 3 cwt. in the untreated controls, the corresponding figures for sugar-content being 18·2, 18·3, 18·3, and 17·1 per cent. The average yield for the plots given the late applications of borax and borocalcite was, respectively, 10 tons 2 cwt. and 9 tons 8 cwt., as compared with 6 tons 16 cwt. in the untreated controls, the corresponding figures for sugar-content being 17·3, 17·3, and 15·9 per cent.

Zaumeyer (W. J.) & Kearns (C. W.). **The relation of aphids to the transmission of Bean mosaic.**—*Phytopathology*, xxvi, 7, pp. 614–629, 1936.

This is an amplified, tabulated account of field and greenhouse

studies on the aphid transmission of bean (*Phaseolus vulgaris*) mosaic [*R.A.M.*, xv, p. 766], a preliminary note on which by the first-named writer has already appeared [ibid., xii, p. 414]. The following aphids, in addition to those previously recorded, were found capable of conveying the disease from infected to healthy plants: *Aphis medicaginis* from *Amaranthus retroflexus* and *P. lunatus*, *A. spiraecola* from *Spiraea vanhouttei*, and *Rhopalosiphum pseudobrassicae* from turnip, producing, respectively, 44, 87, and 100 per cent. mosaic. The infection percentages for the other aphids used ranged from 52 for *Illinoia* [*Macrosiphum*] *pisi* from peas to 93 for *Hyalopterus atriplicis* from *Chenopodium album*.

Sasaki (M.). **On the anthracnose of Adzuki Bean in Hokkaido.**—*Rep. Hokkaido agric. Exp. Sta.* 36, pp. 53–77, 1936. [Japanese, with English summary on pp. *3–4*.]

A species of *Colletotrichum* identical in morphology with *C. phaseolorum* Takimoto [*R.A.M.*, xiv, p. 342] has been isolated from circular, reddish-brown spots on adzuki bean (*Phaseolus radiatus* var. *aurea*) [*P. angularis*] leaves in various localities of Hokkaido. Inoculation experiments with the pathogen on a number of legumes were unsuccessful except in the case of its own host and kidney beans [*P. vulgaris*], which reacted feebly by the development of a pale yellowish foliar discoloration. Good growth was made on onion, apricot, soy, rice-malt, asparagin, and Czapek's agars at a hydrogen-ion range between P_H 6·06 and 8·03. The minimum, optimum, and maximum temperatures for the development of the *Colletotrichum* were found to be 4° to 5°, 28°, and 37° C., respectively. Control measures should be based on improved cultural methods, seed treatment for 30 minutes with 0·1 per cent. mercuric chloride or 35 per cent. formaldehyde (1 in 240) and two to three applications, at fortnightly intervals, of 2–2–50 or $2\frac{1}{2}$–$2\frac{1}{2}$–50 Bordeaux mixture.

Kheswalla (K. F.). **A Phoma disease of Asparagus.**—*Indian J. agric. Sci.*, vi, 3, pp. 800–802, 1 col. pl., 1936.

Asparagus plants at Pusa were observed in 1935 to be attacked by a disease characterized by a brown discoloration and shrivelling of the stems. The central tissues of the lesions turn ashy-white and later bear dark-coloured pycnidia, which rupture the epidermis, causing longitudinal cracks. The growth of the lateral branches is frequently arrested. All parts of the plants except the berries are liable to infection. In advanced cases the needles turn yellow, and partial or complete desiccation ensues.

Pure cultures of the fungus were obtained on Quaker oats agar and inoculated into wounded and unwounded stems with positive results. Mycelial growth was profuse on Quaker oats but pycnidia failed to mature; the latter were formed, however, on sterilized fragments of asparagus stems and produced numerous hyaline, oblong to fusiform, unicellular pycnospores, measuring 5·1 to 10·2 by 1·7 to 3·4 μ and thus agreeing with Bubak's description (*Bull. Herb. Boiss.*, vi, Sér. 2, p. 408, 1906) of the A spores of *Phomopsis asparagi*. The absence of B spores precludes the identification of the Indian fungus as a *Phomo-*

psis and it is consequently referred to *Phoma asparagi* [*R.A.M.*, xii, p. 395].

Brown (J. G.) & Butler (K. D.). **Sclerotiniose of Lettuce in Arizona.**—*Tech. Bull. Ariz. agric. Exp. Sta.* 63, pp. 475–506, 10 figs., 5 graphs, 1936.

Head lettuce, a major source of commercial gain in Arizona, is liable to severe infection by sclerotiniose, 'drop', or 'watery soft rot' (*Sclerotinia sclerotiorum*) [*R.A.M.*, xv, p. 167], first recorded in the State in 1925. The symptoms of the disease and life-history of the fungus are described in semi-popular terms, a list of its hosts (over 100) is given, the environmental conditions favouring infection are discussed, and control measures recommended. The ascospores of *S. sclerotiorum* appear to be capable of travelling several miles in a viable condition in Arizona and the sclerotia are disseminated on diseased plant material, in soil adhering to implements and the feet of men and animals, and especially in irrigation and flood water.

At the lower elevations in the southern part of the State infection is possible only during the late autumn, winter, and early spring, when the night temperature ranges from 32° to 50° F., but by means of its sclerotia the fungus survives the summer and may remain alive in dry soils for eleven years. Under damp conditions, however, these bodies may rot extensively in the soil, and experiments with tap water indicate that large numbers can be killed by flooding infected fields for over 18 days.

The disease may be combated by strict attention to field sanitation, deep ploughing, crop rotation with immune plants (e.g. maize), roguing of diseased lettuces, and soil disinfection; in connexion with the last-named laboratory experiments gave promising results in the case of sulphuric acid and funginox (a commercial preparation of mercuric chloride in hydrochloric acid). A 1 per cent. solution of the former destroyed the sclerotia in 30 hours, while the latter was effective in 24 at a dilution of 1 in 1,000. For field treatments it would be necessary to use a 2 per cent. solution of sulphuric acid, so that the estimated cost of $80 per acre (exclusive of labour) would probably be too high except on small plots or for drenching the soil after roguing; funginox is recommended for similar purposes.

Joëssel (P. H.). **Essais de traitements contre les maladies du Melon. (Année 1935.)** [Experimental treatments against Melon diseases. (Year 1935.)]—*Ann. Épiphyt.*, N.S., ii, 1, pp. 21–30, 3 graphs, 1936.

In further spraying experiments against melon diseases carried out at Avignon [*R.A.M.*, xv, p. 628] only powdery mildew [*Erysiphe cichoracearum*] developed but the results again confirmed the efficacy of Bordeaux mixture against this disease. The best result was given by the Bordeaux mixture with lime-sulphur (1 kg. copper sulphate, 1 kg. caseinated lime, 2 l. lime-sulphur 32° Baumé per 100 l.), which in addition to its great fungicidal value also markedly stimulated growth. Lime-sulphur alone was both fungicidal and stimulating. Potassium permanganate was ineffective, oxyquinoline [ibid., xiii, p. 690] rather

better, and malachite green [ibid., xiv, p. 765] and phosphine sulphate (each 0·1 kg. with 0·5 l. amyl alcohol per 100 l.) better still. Copper sulphide proved less satisfactory than had been expected. The alternate use of Bordeaux mixture and lime-sulphur gave a slightly better result than either alone. Powder A (containing 60 per cent. sulphur and 2 per cent. copper acetate) was definitely fungicidal, and gave better results when used with Bordeaux mixture than when used alone; used with lime-sulphur it slightly increased yield. Powder B (containing 10 per cent. copper sulphate) appeared to give some control of mildew.

Wilson (J. J.). **The pathological relationship between the host and parasite in varieties and strains of Watermelons resistant to Fusarium niveum E. F. S.**—*Res. Bull. Ia agric. Exp. Sta.* 195, pp. 107–152, 7 figs., 5 graphs, 1936.

A detailed account is given of the author's histological studies of the infection of the watermelon by *Fusarium* [*bulbigenum* var.] *niveum* [*R.A.M.*, xv, p. 553] in Iowa, the results of which showed that watermelon plants are susceptible at all stages of their growth to invasion by the fungus through the root tips [ibid., xiv, p. 144] and ruptures formed by newly developed lateral roots. Under conditions favourable for the parasite, the xylem vessels in the primary root of both resistant and susceptible varieties were rapidly invaded at, or shortly after, germination of the seed by the mycelium, resulting in a high percentage of wilting. While variations in environmental conditions retarded or accelerated wilting for periods from one to several days, there was a general upward trend in the percentage average daily wilt which reached a maximum at 23 to 39 days after planting susceptible seedlings and at 16 to 24 days with resistant seedlings; with the latter, this maximum was followed by an abrupt drop of the daily wilt down to less than 1 per cent. in plants 40 to 45 days old. While older susceptible plants, repeatedly infected through young lateral roots, apparently died from internal pathological disturbances involving the accumulation of gum-like substances, tyloses, and mycelium in the xylem vessels, older resistant plants appeared to develop a defensive mechanism which allowed them to withstand the attacks of the parasite. A significant feature was that in fields heavily infected with *F. bulbigenum* var. *niveum*, the surviving plants showed gum-like substances occluding the vessels surrounding the older xylem near the centre of the root axis, while the secondary xylem at the periphery of the stele remained unaffected; wilted susceptible plants, on the other hand, were filled with gum-like matter throughout the primary root system.

In studies of the inheritance of varietal resistance, Pride of Muscatine, Iowa King, and more particularly Iowa Belle were shown to be suitable for transmission of resistance, and backcrossing the F_1 hybrid (resistant × susceptible variety) to the resistant parent has proved the most effective method of building up resistance. It is pointed out, however, that in exceptionally heavily infected soil Iowa King selections failed to show measurable differences in resistance as compared with susceptible controls.

Ark (P. A.) & Tompkins (C. M.). **Bacteriosis of Pumpkin fruits in California.**—*Science*, N.S., lxxxiv, 2166, p. 18, 1936.

In September, 1935, young pumpkins of the Early White Bush Scallop, Yellow (or Golden) Summer Crookneck, Zucchine, and Danish varieties near San Pablo, California, were severely attacked by a bacterial soft rot, which was apparently favoured by warm, moist weather and rapidly disseminated by insects, especially *Diabrotica* sp. In one field the losses were found to range from 60 to 75 per cent. Only immature fruits were infected.

The causal organism is stated to differ from the related *Erwinia carotovora* [*Bacillus carotovorus*] in its host range, comprising 22 horticultural varieties of pumpkin, carrot, and celery (both natural hosts), and 10 other plants, as well as in its morphological and physiological characters. A striking feature of the pumpkin organism is the pale pink coloration which it develops on eosin-methylene blue agar slants.

Chaze (J.) & Sarazin (A.). **Nouvelles données biologiques et expérimentales sur la môle, maladie du Champignon de couche.** [New biological and experimental data on the 'môle' disease of the edible Mushroom.]—Reprinted from *Ann. Sci. nat., Bot.*, Sér. 10, xviii, 84 pp., 3 pl., 8 figs., 1 graph, 1936.

In this full, detailed account of their investigations into the morphological, cytological, and immunological aspects of the môle disease (*Mycogone perniciosa*) of mushrooms (*Psalliota*) [*campestris*] (with which is associated, in a secondary capacity, a species of *Verticillium*), [already noticed in part from other sources: *R.A.M.*, xiv, pp. 554, 674, 739], the authors state that *P. campestris* possesses a natural immunity from infection, due not to phagocytosis, but to the humoral secretion of an antibody [ibid., xv, p. 700]. In pure culture, the vegetative hyphae of *P. campestris* prevent the germination of the spores of *M. perniciosa*, or the development of the hyphae, and also produce profound modifications in the sporulation of both fungi associated with the disease. The mycelium of *P. campestris* invades the cultures of both parasites without becoming affected, and culture media on which it had grown prevented the germination of the spores of the latter, the antibodies secreted by *P. campestris* becoming diffused in the media. The parasitism of *M. perniciosa* on the mushroom may, therefore, be considered as a reversible phenomenon. In pure culture, the immunity of *P. campestris* is complete; in the beds, resistance is only partial. This loss of resistance is difficult to explain but may possibly be attributed to the destruction of vegetative hyphae by bacteria or to the transformation and neutralization of the antibodies as a result of bacterial action. The formation of antibodies by *P. campestris* is the first example of humoral secretion recorded among fungi. Experiments on the control of the disease are in progress.

Passecker (F.). **Ein neuer Unkrautpilz auf Champignonbeeten (Pleurotus passeckerianus Pilát).** [A new weed fungus in Mushroom beds (*Pleurotus passeckerianus* Pilát).]—*Z. PflKrankh.*, xlvi, 6, pp. 271–277, 1 fig., 1936.

The enemies of the cultivated mushroom (*Agaricus* [*Psalliota*]

campestris) include, in addition to actual parasites, a number of so-called 'weed' fungi, which deprive the host of its nutrient medium, restrict its natural extension, and possibly emit noxious metabolic products. The writer has recently investigated in Vienna, in collaboration with A. Pilát, a new species of *Pleurotus*, believed to have been commonly confused in the past with *P. mutilus* [*R.A.M.*, xi, p. 493], which is to be described in a forthcoming publication by C. Kawina and A. Pilát entitled 'Atlas des Champignons de l'Europe' (Prague) as *P. passeckerianus*. The new fungus differs from *P. mutilus* in the very friable texture of the cap, the extremely tenuous or absent stalk, the creamy-yellow to faintly pink lamellae, the floury smell and taste, and the much richer fat-content of the white to very pale pink spores (9 to 11 by 4 to 5 μ), basidia, and other organs.

Details are given of parallel tests in which *P. passeckerianus* (germinated on a gelatine medium) and the cultivated mushroom were grown on horse dung in the same vessel at 10° to 14° and 18° to 19° C., the latter completely overrunning the former at the lower temperature, whereas at the higher the position was reversed.

Precautionary measures against the introduction and spread of the 'weed' fungus should include the use of 'pure culture spawn', careful preparation of the medium, timely planting at a relatively low temperature, and disinfection of the beds with 2·5 per cent. lysol [loc. cit.].

Golding (F. D.). **Bemisia nigeriensis Corb., a vector of Cassava mosaic in Southern Nigeria.**—*Trop. Agriculture, Trin.*, xiii, 7, pp. 182–186, 1936.

In further work in Southern Nigeria on the transmission of cassava mosaic by *Bemisia nigeriensis* [*R.A.M.*, xv, pp. 72, 701] 606 and 400 adult individuals collected from mosaic cassava in the field were placed in two cages containing four and two healthy cassava plants, respectively, and all six plants developed the disease. When 26 and 64 adults were introduced into two lamp chimneys each containing one healthy plant, both plants became diseased 27 days later. In three experiments in which large numbers of the insects were placed on cassava plants in cages on different dates the maximum intervals between the introduction of *B. nigeriensis* and the first appearance of mosaic were 13, 19, and 21 days, respectively. Observations made on 19 cassava varieties over 34 weeks showed that those which were resistant to mosaic were more lightly infested by the insects than were the susceptible varieties. But when 1,802 adult individuals of *B. nigeriensis* were placed in a cage containing 4 mosaic and 2 healthy plants of each of 5 resistant varieties, the latter did not develop mosaic and the apparent immunity shown by certain varieties is therefore attributed to inherent resistance rather than to any repellent effect upon the insect vector.

The seven most resistant cassava varieties studied had purple petioles, while of the ten most susceptible varieties five had green, and five purple or purplish petioles. Attempts to transmit mosaic from cassava to *Manihot glaziovii* and *Euphorbia heterophylla* were unsuccessful but on two occasions *M. glaziovii* was observed to show symptoms resembling cassava mosaic.

Loucks (K. W.). **Spraying experiments for the control of certain Grape diseases.**—*Bull. Fla agric. Exp. Sta.* 294, 16 pp., 1 fig., 1936.

In vine-spraying tests carried out from 1932 to 1934 in Florida, where the principal diseases of the berries are black rot (*Guignardia bidwellii*) [*R.A.M.*, xiv, pp. 10, 557], bitter rot (*Melanconium fuligineum*) [ibid., vi, pp. 11, 460], and ripe rot (*Glomerella cingulata*) [ibid., x, pp. 358, 359], Bordeaux mixture gave the best control of all rots, especially when applied during blossoming and fruit setting. Bitter rot and ripe rot were more difficult to control than black rot. Owing to the residue left by Bordeaux mixture, a stainless spray should be used as the fruits approach the ripening stage.

As a result of the experiments the following spray schedule is recommended: (1) delayed dormant, copper sulphate 4 lb. in 50 galls. water, with sticker; followed by Bordeaux 4–4–50 plus insecticide (2) 7 to 10 days after the buds burst (or when the shoots are 8 to 18 in. long), (3) at bloom opening, (4) after the bloom has opened, (5) after fruit set, and (6) when the fruit is half grown; by copper acetate 2 lb. in 50 galls. water, with 2 oz. gelatine and insecticide (7) when the fruit is nearly full size and (8) full size (without gelatine); and by Bordeaux mixture 4–4–50 with sticker, and, if necessary, insecticide (9) as soon as the fruit is gathered.

Moreau (L.) & Vinet (E.). **Sur la vigueur de la Vigne dans ses rapports avec le sol, la fumure, et quelques maladies de la grappe.** [On the vigour of the Vine in its relations with soil, manuring, and some diseases of the bunches.]—*Ann. agron., Paris*, vi, 4, pp. 542–558, 2 graphs, 1936.

In studies on the effect of soil type and fertilizers on vine vigour and the relation of such vigour to the development of disease the authors found that in the part of the experimental vineyard where the vine grew well naturally (bottom of the hill) and where the addition of fertilizers had little effect (under 16 per cent. increased vigour), coulure [non-setting of the flowers: *R.A.M.*, x, p. 640] was not conspicuous, but where growth was not naturally vigorous (top of the hill) the addition of balanced fertilizer increased the disease. Grey rot of the fruit [*Plasmopara viticola*] and *Oidium* [*Uncinula necator*] were favoured by increased growth, whether due to soil type or fertilizer, but whereas the former disease was constantly related to vine vigour, without regard to the part of the vineyard concerned, the latter was affected by local conditions.

Fertilizer lacking in potassium only increased vigour (and then slightly) in that part of the vineyard where vegetation was naturally weakest. It reduced coulure, grey rot, *P. viticola*, and mildew, and was the only fertilizer tested that had an adverse effect on the two fungi.

The authors conclude that factors increasing the growth rate or prolonging the growth period also increase susceptibility to disease of organs in active growth, and other things being equal, the progress of growth of the vine is regarded as the best indication of disease susceptibility and resistance.

Branas (J.) & Bernon (G.). **Recherches sur le traitement de la panachure.** [Studies on the control of variegation.]—*Rev. Vitic., Paris,* lxxxv, 2193, pp. 26–27, 1936.

The authors state that the condition of the vine known in France as 'panachure' [variegation] is a partial yellowing of the leaves, not amenable to control by spraying with iron compounds. It only occurs on vines that are definitely affected with 'court-noué' [*R.A.M.*, xv, p. 631], or on stocks that seem likely to develop this disease. Preliminary experimental results appear to indicate that this condition may be remedied by carefully spraying the affected foliage with an 8 to 10 per cent. suspension of lamp-black in water with 0·3 per cent. gelatine. The treatment evidently causes an increase in the temperature of the leaves sprayed and may result in scorching of the thin-leaved varieties, such as Aramon, for which reason the spray should be applied in the early hours of the morning.

Bericht der Eidgenössischen Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil für die Jahre 1931/1934. [Report of the Federal Experimental Institute for Fruit Growing, Viticulture, and Horticulture, Wädenswil, for the years 1931 to 1934.] —*Landw. Jb. Schweiz,* l, 6, pp. 569–666, 3 figs., 1936.

Among the numerous items of phytopathological interest in this report not already summarized from other sources, the following may be mentioned. In 1931 and 1933 a bud rot of apples, associated with the pink mycelium of a *Fusarium* [? *lateritium*: cf. *R.A.M.*, vi, p. 734] and with bacteria, was prevalent in various parts of Switzerland. The contents turned brown and the buds and brachyblasts died and fell. Severely affected varieties included Boskoop, Bohn, and Gravenstein, in which 16 to 97 per cent. of the buds were killed.

The most active agent of decay among apples stored at temperatures 4°, 2·5°, 0°, and —1° C. in 1929–30 and 1930–1 was *Gloeosporium album* [ibid., xiv, p. 771] which attacked 67·9 per cent. of the fruit in the former and 85·1 per cent. in the latter year, followed by *F. putrefaciens* [*F. avenaceum*: ibid., xiii, p. 35]. In general, the tendency to storage rot increases parallel with the age of the fruit and does not become prominent until February; the incidence of infection declines with falling temperature, although 365 out of 1,376 were attacked at 0°, mostly by *G. album*. Storage rot does not affect all varieties equally, Jakob Lebel, Boskoop, and Gravenstein being among the most susceptible, while Glocken [Bell], Berne Rose, Croncels Transparent, Canada and Ontario Pippins, and Minister Hammerstein are very resistant. Both in 1932–3 and 1933–4 the introduction of ozone into the cold storage chamber largely prevented the fungal decay of apples and cherries held at 0° [cf. ibid., xv, p. 722].

Dormant applications of 5 per cent. carbolineum retarded the development of rose rust (*Phragmidium subcorticium*) [*P. mucronatum*: ibid., xv, pp. 506, 653] and maintained the bushes in a vigorous state throughout the summer. Both 1·5 per cent. Bordeaux mixture and 1 per cent. fungan (Schenk, Wollishofen) [ibid., xii, p. 450] gave satisfactory control of dahlia leaf spot (*Entyloma*) [*dahliae*: see below, p. 63] in 1931, when spraying was carried out on 1st and 16th July.

Săvulescu (T.), Sandu-Ville (C.), Aronescu (A[lice]), & Alexandri (V.). **L'état phytosanitaire en Roumanie en 1934–1935.** [Phytosanitary conditions in Rumania in 1934–1935.]—*Publ. Inst. Cerc. Agron. României*, 25, 97 pp., 23 figs., 2 maps, 1936. [Rumanian, with French translation.]

In October 1934, favoured by a warm, wet autumn a severe outbreak of *Puccinia triticina* occurred on young wheat throughout Rumania [cf. *R.A.M.*, xv, p. 201], but the infection did not cause important losses. Against bunt (*Tilletia foetens* and *T. tritici* [*T. caries*]) the best seed disinfectants were formalin, germisan, uspulun, urania, higosan [ibid., xiv, p. 499], and ceresan, which gave, respectively, 99·5, 99·5, 99·5, 99·4, and 98·1 per cent. clean ears. Maize was widely affected by rust (*P. maydis*) the degrees of infection shown by 14 different lines of the Regele Ferdinand variety ranging from 0 to 5. *Ustilago zeae* was present on maize in all parts, 10 lines of Regele Ferdinand maize showing from 5 to 71 per cent. infection, and four of Pignoletto Todireşti 8 to 20 per cent.

Soy-beans suffered important losses in many districts from three forms of virus disease, leaf curl, brown mosaic, and yellow mosaic [ibid., xv, p. 202]. The first, which was the least common, was characterized by dwarfing of the plants and crimping of the leaves, which were asymmetrical, irregularly shaped, bore protuberances on the upper surface, and had rolled-in edges; mosaic symptoms were sometimes present as well. The second appeared as brown, angular spots along the veins, or brown spots irregularly scattered over the surface. The third, and most prevalent, form consisted in a yellow discoloration along the veins, the leaves having a marbled appearance. General chlorosis was sometimes present; vegetation was retarded. From all three forms the only organism isolated was the yellow mosaic virus, inoculations with which into healthy soy-beans reproduced symptoms of disease, the incubation period ranging from 6 to 13 days. The virus was inactivated by exposure to a temperature of 80° C., and by the addition of 96 per cent. alcohol (30 parts to 70 parts of juice). It was weakly pathogenic to beans, but produced no symptoms on groundnut or tomato.

Luffa in experimental plots was affected by a mosaic which in one plot caused a 20 per cent. loss of yield. The leaves became discoloured along the veins, marbled, and dried up, the fruits of severely infected plants failing to develop and becoming mummified. A virus was obtained from diseased material, inoculations with which reproduced the condition.

Sorghum near Bucarest showed symptoms resembling those attributed by Burrill in 1877 to *Bacillus sorghi*. Reddish-purple spots appeared on the inner surface of the sheaths of the lower leaves, and later on the lamina, whence they spread irregularly towards the top of the plant. From infected material a Gram-negative bacterium with an optimum growth temperature of 30° to 31° was isolated. Inoculation experiments indicated that it might be the causal organism, but that it was dependent on aphids for introducing it to the host and effecting its spread.

Chilli pepper [*Capsicum annuum*] was again attacked by *Actinomyces*

totschidlowskii Serb. [ibid., xv, p. 261], the losses reaching 50 per cent. of the crop in one locality.

In one nursery peonies were infected by *Cladosporium paeoniae* [ibid., viii, p. 293]. Leaf spot (*Heterosporium pruneti*) [ibid., vii, p. 581] was widespread on *Iris germanica*. Cherries suffered from leaf fall due to *Cercospora cerasella* [ibid., x, p. 774], pears were attacked by *Gymnosporangium sabinae* [ibid., xiii, pp. 316, 398], and walnuts, for the first time in Rumania, by *Alternaria nucis*, which principally affected the young fruits, though infection can occur at any time during growth. *Nectria applanata* was very common on walnuts in nurseries, especially on the 'noble' varieties.

[Walters (E. A.).] **Report on the Department of Agriculture, St. Lucia, 1935**—pp. 30–32, 1936.

During the year under review, 750,000 banana plants were inspected in St. Lucia, and 6,504 (or 0·86 per cent.) affected with Panama disease [*Fusarium oxysporum cubense*] destroyed [*R.A.M.*, xv, p. 2]. The Colony is divided for banana inspection purposes into nine main districts, each under an officer whose duty it is to organize inspection and the nursery supply of plants, and when possible to select and lay out new plantations. If more than 2 per cent. Panama disease is found in an area, special concerted measures are arranged, and, if practicable, the area is isolated.

Nattrass (R. M.). **Annual Report of the Mycologist for the year 1935.**—*Rep. Dir. Agric. Cyprus, 1935*, pp. 57–64, 1936.

During 1935 [cf. *R.A.M.*, xiv, p. 741], wheat in Cyprus was widely infected by *Septoria tritici* [ibid., xv, p. 775], much of the early withering of the outer leaves being due, apparently, to this fungus. Seed treatment of wheat with formalin and copper carbonate against bunt (*Tilletia caries* and *T. foetens*) in small-scale trials gave complete control as against 1·8 and 2·5 per cent. infection in two untreated control plots, and 0·9 and 0·2 per cent. in two plots treated with agrosan G. In many localities *S. passerinii* [ibid., xi, p. 745] caused a withering of the first-formed leaves of barley, while net blotch (*Helminthosporium teres*) [ibid., xv, p. 86] was present everywhere but unimportant. Young oats were attacked by *H. avenae* [ibid., xv, pp. 289, 456], which seldom infects mature plants.

The *Botrytis* causing chocolate spot of beans (*Vicia faba*) was found by Sardiña closely to resemble *B. fabae* [ibid., xiv, p. 734; xv, p. 698] but had rather larger sclerotia. Zonate leaf spot (*Cercospora zonata*) [ibid., xiv, p. 83] was common on beans grown under trees, often in association with chocolate spot.

In a potato field in Famagusta about 80 per cent. of the plants developed a shrivelling of the main stem with consequent collapse of the whole plant due to *Pythium butleri*. The fungus, not previously recorded in Cyprus on any economic crop, was a virulent parasite under the conditions obtaining and also affected *Festuca* in patches on a newly planted lawn. *Alternaria solani* was frequently present on tomatoes [ibid., xv, p. 406] growing in the vicinity of severely affected

potatoes. Celery was affected by a virus disease probably akin to yellows [cf. ibid., xv, p. 808] in one locality.

Clasterosporium carpophilum was recorded for the first time on leaves of stone fruits. *Puccinia pruni-spinosae* [ibid., xv, p. 704] caused severe apricot shot hole. *Sphaerotheca pannosa* and *Phyllactinia corylea* [ibid., xiv, p. 680] were locally severe on peach and almond, respectively, the former vigorously attacking the fruit. *Sphaeropsis malorum* Peck [*Physalospora obtusa*: ibid., xv, p. 774], not previously recorded on the fruit, was isolated from apples attached to the tree. Citrus was affected by the two physiological diseases mottle leaf [ibid., xv, p. 778] and 'lefka blemish' (identified by Reichert as 'dry, shallow nooksan'), the latter characterized at picking time by hard, brown, slightly sunken lesions up to 1 cm. in diameter, and usually not over 1 mm. deep.

Exobasidium unedosis was observed on *Arbutus unedo*, and the aecidial stage of *Puccinia graminis* on *Berberis cretica*, both for the first time.

Report of the Director for the year ending 31 October, 1935.—*Bull. Conn. agric. Exp. Sta.* 318, pp. 165–202, 1936.

Apart from information already noticed from other sources, this report contains the following items of interest. The potato variety 44–488 obtained from the United States Department of Agriculture, besides being resistant to blight (*Phytophthora infestans*), is also highly resistant to drought and tipburn [*R.A.M.*, xiii, p. 261]. Unsprayed plants produced 184 bushels per acre, as compared with only 85 bushels for unsprayed, certified Green Mountain potatoes in an adjoining plot.

Further investigations into a disease of peach trees, referred to as 'X disease', showed that it is probably due to a virus and is introduced into the orchard by a wild host. During one season control was effected in 50 to 100 per cent. of the cases by the removal of diseased branches. Healthy trees budded with diseased cuttings in 1934 showed a larger percentage of disease than those budded in 1933. The chokecherry [*Prunus virginiana*] appears to be a possible source of infection, as in those parts of Connecticut where the disease is present these trees show a mosaic-like condition of the leaves resembling X disease, and are also commonly associated with diseased peaches in the orchard. The prompt removal of all diseased material appears to be the best method of control at present.

Continued spraying tests with lead arsenate, lime, and oil as a combined fungicide and insecticide effectively controlled sooty blotch [*Gloeodes pomigena*: ibid., xiv, p. 452] and scab [*Venturia inaequalis*: ibid., xv, p. 728] on all apple varieties except McIntosh. In one orchard of Wealthy apples practically no cedar rust [*Gymnosporangium juniperi-virginianae*: see below, p. 75] occurred on trees kept covered with a spray of lime-sulphur with casein glue.

Dead blossom leaf-spot of tobacco was occasioned by *Alternaria tenuis*, *Botrytis cinerea*, and other fungi developing on fallen blossoms and spreading to the leaves and from leaf to leaf in the curing shed. Three types of pole rot of tobacco were differentiated, viz., freckle, web, and vein rots, the first of which is attributed to *A. tenuis*.

Hungerford (C. W.). **Plant pathology.**—*Rep. Idaho agric. Exp. Sta. 1935*, (*Bull.* 220), pp. 39–43, 2 figs., 1936.

A severe epidemic of curly top in the Twin Falls section in 1935 was responsible for heavy losses in Contract seed bean [*Phaseolus vulgaris*] crops [*R.A.M.*, xiv, p. 339] and for somewhat lighter ones among Great Northerns, of which the most resistant strain was University Selection No. 81, also resistant to mosaic [see above, p. 11]. A few white-seeded segregants from a Red Mexican–Great Northern cross made in 1929 and grown in 1935 at Buhl, Idaho, under a heavy beet leafhopper [*Eutettix tenella*] infestation, showed a high degree of resistance to curly top. The following disease percentages were recorded for the U I 59, 81, 88, and 123 strains and the Ellsworth and Common bean varieties: common mosaic, 0, 0, 0, 0, 0, and 85, respectively; yellow mosaic, 1, 2, 3, 2, 5, and undetermined; curly top (16th July), 12, 2, 26, 5, 13, and 9; the bushel yields per acre were, respectively, 38·3, 38·1, 5, 42·6, 30·3, and 22·5. In addition to the plants already reported as susceptible to curly top may be mentioned *Zinnia* and a number of ornamentals.

Pea mosaic [ibid., xv, p. 551] was severe in the McCall–Cascade green pod pea area on the Alderman, Dwarf Alderman, and Laxton's Progress varieties, causing up to 75 per cent. infection. A fairly high proportion of the red clover [*Trifolium pratense*] plants in the neighbourhood of the pea fields showed mosaic symptoms, and greenhouse tests demonstrated the identity of the virus on peas, red clover, and alsike [*T. hybridum*].

Copper carbonate was found to be the most effective treatment of wheat seed-grain against bunt [*Tilletia caries* and *T. foetens*], infection by which in 1935 was the heaviest on record since 1928, reaching 60 to 75 per cent. in the Malad Valley. None of the 14 varieties tested in the winter wheat nurseries showed absolute resistance to both 'tall' [*T. foetens*] and 'short' [*T. caries*] bunt but Relief is almost immune from the latter [ibid., xi, p. 502], (which was exceptionally prevalent during the period under review causing stunting of the plants), and resistant to many strains of the former, so that it may be recommended for the dry land wheat-growing section in the south-east of Idaho.

Barley plants attacked by stripe [yellow] rust [*Puccinia glumarum*] were much less resistant to low temperatures than healthy ones, those with 100 per cent. infection being killed at 21° F.

The perfect stage of *Phoma medicaginis* [ibid., xiii, p. 32], the causal organism of a widespread lucerne disease known as 'black stem', was found to be *Pleospora rehmiana*.

Cheo (C. C.). **A preliminary survey of plant diseases on cultivated plants in Hopei Province 1934–1935.**—*Chin. bot. Mag.*, iii, pp. 977–1011, 34 figs., 1936. [Chinese, with English summary.]

Notes are given on the economic importance and distribution on 63 cultivated plants in Hopei Province, China, of 151 diseases, among which may be mentioned a bacterial infection of wheat in Tinghsien closely resembling the yellow gum disease (*Aplanobacter agropyri* O'Gara); *Coniothyrium diplodiella* on grapes [*R.A.M.*, xv, p. 200]; and a prevalent leaf spot of apricots (*Guignardia* sp.) in the vicinity of Peiping [Peking].

ROGER (L.). **Notes de pathologie végétale. II.** [Notes on plant pathology. II.]—*Agron. colon.*, xxv, 223, pp. 15–23, 1936.

In these further notes on fungal diseases observed on material received from the French overseas possessions [*R.A.M.*, xv, p. 283] an account is given of a spotting of groundnut pods caused in Senegal by a *Rhizoctonia* [ibid., xiv, p. 212] producing chocolate-brown, round or irregular, isolated or confluent spots 2 to 10 mm. or more in diameter, sometimes covering half the surface of the pods but not penetrating the interior. The attack occurs late in the season and the development of the nuts is unaffected. In 1933–4 widespread infection of date palm leaves by *Graphiola phoenicis* [ibid., xii, p. 270] took place at Bamako. In the north of Dahomey cotton seed suffered from a pulverulent, carbonaceous rot caused by *Rhizopus arrhizus*.

Механизация борьбы с вредителями и болезнями сельскохозяйственных культур. [Mechanization of the control of agricultural pests and diseases.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 322–377, 10 diags., 7 graphs, 1936.

In this section of the report of the Institute of Plant Protection brief accounts are given of improvements which have been introduced in mechanical appliances used in the U.S.S.R. for the control of crop diseases. Of the six locally constructed seed-disinfecting machines tested by him, P. G. Davydoff states that Borghardt's KP-1 combined seed disinfector [*R.A.M.*, xv, p. 428] proved to be the best for extensive estates. Another combined cereal seed-grain disinfector (Popoff's P-2) is stated by V. G. Krasjko [Kraśko] to have a working capacity (dusting) of 6 to 10 tons per hour, and to be of satisfactory efficacy. J. A. Meissakhovitch briefly describes and figures a hand-driven machine for treating (by dipping) cotton seed with formalin, by means of which three men can handle up to 600 kg. seed per hour. Kraśko gives details of tests of two fruit-tree sprayers, constructed by the Vulcan works, each capable of either horse- or motor-traction, and having spraying capacities of from 2·5 to 5 hect. 3- to 5-year-old and 0·8 to 3 hect. 15- to 30-year-old fruit trees per hour.

VAUPEL (O.). **Mittel für Saatgutbeizung.** [Seed-grain disinfection preparations.]—*Dtsch. landw. Pr.*, lxiii, 34, p. 422, 1936.

Attention is drawn to certain alterations in the newly published list of cereal seed-grain disinfectants officially recognized by the German Plant Protection Service [see next abstract]. A slight reduction ($\frac{3}{4}$ l. per 100 kg.) has been made in the quantity of ceresan liquid required for the control of barley stripe [*Helminthosporium gramineum*] by the short disinfection process, but on the other hand the amount recommended for the treatment of rye seed-grain against snow mould [*Calonectria graminicola*] is increased from $2\frac{3}{4}$ to 3 l. Germisan is no longer applicable to the treatment of oats [against loose smut, *Ustilago avenae*] by the short disinfection process.

Becker (K. E.). **Zur Herbstbeizung.** [On autumn disinfection.]—*Dtsch. landw. Pr.*, lxiii, 35, p. 438, 1936.

Following a brief introductory note on the paramount importance of cereal seed-grain disinfection in German agriculture, the writer tabulates, with explanatory comments, the preparations officially recognized (August, 1936) by the Plant Protection Service as effective against the principal seed-borne diseases [see preceding abstract]. The following alterations are made in the previous year's recommendations [*R.A.M.*, xv, p. 83]. Abavit nassbeize Schering controls wheat bunt [*Tilletia caries* and *T. foetens*] at a concentration of 0·1 per cent. (30 minutes' immersion). Weizenfusariol and roggenfusariol are withdrawn from the schedule. Germisan is efficacious against snow mould of rye [*Calonectria graminicola*] at 0·4 per cent. (sprinkling). This fungus is also controllable by ceresan nassbeize (U. 564) at a strength of 1·75 to 2 per cent., using the short disinfection process with 1·5 l. per 50 kg. The same preparation (2 per cent.) and method are recommended for the elimination of barley stripe [*Helminthosporium gramineum*], which is further amenable to treatment with fusariol dust 1454a (Chem. Fabrik Marktredwitz A.G.) at the rate of 100 gm. per 50 kg. Two new dusts, effective against loose smut of oats [*Ustilago avenae*] in addition to the diseases already mentioned, have been added to the list, viz., abavit-neu universal-trockenbeize (Schering-Kahlbaum A.G.) and akasan (Dr. A. Kossel, Marktredwitz).

Behlen (W.). **Wo stehen wir heute in der Beizfrage? Rückblick und Ausblick.** [Where do we stand to-day as regards the disinfection question? Retrospect and outlook.]—*Nachr. Schädl. Bekämpf., Leverkusen*, xi, 3, pp. 105–112, 5 figs., 1936. [English, French, and Spanish summaries on pp. 153, 156–157, 161.]

The progress made in Germany during the last ten years in the co-operative disinfection of cereal seed-grain is reviewed [*R.A.M.*, xiv, p. 380] and suggestions made for further efforts (by canvassing and demonstration) on the part of treating and cleaning establishments to interest small-holders in this valuable means of increasing their yields, not only of cereals, but also of beetroot, flax, hemp, peas, beans, and the like. It is estimated that some 20 to 40 per cent. of this class of farmers still remains to be convinced of the efficacy of the officially recognized methods of seed treatment.

Bericht über die Tätigkeit der Eidg. agrikulturchemischen Anstalt Liebefeld-Bern im Jahre 1935. [Report on the work of the Federal Agricultural-Chemical Institute, Liebefeld-Bern, during the year 1935.]—*Landw. Jb. Schweiz*, l, 6, pp. 545–568, 1936.

The following note occurs in this report. Attempts to combat the reclamation disease of cereals [*R.A.M.*, xv, p. 792] by the application of copper sulphate (over and above the ordinary complete fertilizer) to Huron wheat, Berna rye, and Goldregen oats at the rates of 0·1 to 0·5 gm. per pot containing 3·5 kg. of soil (corresponding to 30 to 150 kg. per hect.) were most successful in the case of the first-named crop. Rye showed no favourable response to the treatment and the yield of oats was somewhat increased only by the heaviest application.

Greaney (F. J.). **Cereal rust losses in Western Canada.**—*Sci. Agric.*, xvi, 11, pp. 608–614, 1936. [French summary.]

The results of controlled experiments, estimated by the method described in a previous communication [*R.A.M.*, xv, pp. 429, 632], indicated that during the period 1925 to 1935, inclusive, stem [black] rust (*Puccinia graminis*) in Manitoba and Saskatchewan annually reduced the possible wheat crop by 10·8 per cent., equivalent to a loss of $30,784,000, and the oat crop (during 1929 to 1935 only) by 5·5 per cent. or $2,041,000. To this amount must also be added the loss due to deterioration in the quality of the grain, 87·3 per cent. of the carloads of wheat examined in the Western Grain Division in 1933, a rust-free year, being placed in the three top grades, as against 44·8 per cent. in 1935, a bad rust year. It is estimated that during the eleven years under review the annual loss from this source was $2,070,400 for wheat alone. At a conservative estimate the annual loss from cereal rusts in the three prairie provinces averages $40,000,000.

Atkins (J. M.). **Ecological factors in north Texas related to the 1935 stem rust epidemic.**—*Plant Dis. Reptr, Suppl.* 93, pp. 31–41, 3 graphs, 1936. [Mimeographed.]

In the severe wheat stem rust (*Puccinia graminis tritici*) [*R.A.M.*, xv, p. 707) epidemic of 1935, no one factor of weather or condition of crop was responsible for the outbreak in Texas. Favourable temperatures for rust development [ibid., iii, p. 326], excessive precipitation and high humidity, thin stands, and late maturity of the crop all contributed their respective parts, and favourable winds served to carry the abundant inoculum produced over a long period to other States.

Johnston (C. O.), Melchers (L. E.), Laude (H. H.), & Parker (J. H.). **The stem rust epidemic of 1935 in Kansas.**—*Plant Dis. Reptr, Suppl.* 92, pp. 19–30, 1 graph, 2 maps, 1936. [Mimeographed.]

Factors in the wheat stem rust (*Puccinia graminis tritici*) epidemic in Kansas in 1935 were the heavy infection in northern Texas [see preceding abstract], prevailing southerly winds in May and June, heavy rain, high relative humidities, frequent dews, and favourable atmospheric temperatures (during the latter half of May and throughout June), late tillering and heading due to drought in early spring, a long fruiting period, and the susceptibility of the varieties grown.

Rashevskaya (Mme V. F.) & Barmenkoff (A. S.). Выявление расового состава бурой листовой ржавчины Пшеницы **Puccinia triticina.** [Determination of the physiological races of the Wheat brown leaf rust *Puccinia triticina*.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 485–487, 1936.

The results of studies on wheat brown rust (*Puccinia triticina*) material collected from twenty places distributed over the U.S.S.R. [except East Siberia and the Russian Far East] showed the existence there of 13 physiological races of the rust, namely, forms 9, 10, 13, 17, 19, 20, 53, 64, 65, 66, 67, 68, and 69 [*R.A.M.*, xv, p. 707]. Of these forms 65 and 20 were the most widely distributed geographically and occurred

most frequently. The fact that form 66 reacted identically on all the differential varieties used [loc. cit.], while form 64 gave the same reaction on five and an indeterminate reaction on three of the varieties, is considered to indicate the inadequacy of the present range of varieties for distinguishing between certain of the physiological forms of *P. triticina*.

KARGOPOLOVA (Mme N. N.). Фенольные соединения Пшениц в связи с устойчивостью их к **Puccinia triticina.** [Phenolic compounds in Wheats in relationship to their resistance to *Puccinia triticina*.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 491–492, 1936.

In this brief summary the author states that it was experimentally shown that the cell sap of wheat varieties immune from (e.g., *Triticum timopheevi* and *T. monococcum*), or highly resistant to, brown rust (*Puccinia triticina*) is characterized by a high content of protocatechuic phenols, while that of susceptible varieties is poor in or entirely devoid of these compounds [cf. *R.A.M.*, xv, p. 674], both at the germination of the seed and at the waxy maturity stages. Another interesting correlation was the constant prevalence of pyrocatechuic phenols in immune or resistant varieties and of pyrogallic phenols in the susceptible. In special tests, the pyrocatechuic phenols were shown to be highly toxic to the *P. triticina* spores, while the pyrogallic phenols were but weakly toxic.

RYZHKOVA [RYJKOVA] (Mme Z. F.). Влияние зараженности различных с.-х. машин на заспорение зерна спорами твердой головни. [Significance of the contamination of various agricultural machines in the infection of seed-grain with spores of bunt.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 147–149, 1936.

The author gives a few details of tests which showed that harvesting, threshing, and winnowing machines accumulate and serve to spread the spores of wheat bunt [*Tilletia caries* and *T. foetens*] even in regions where the disease is comparatively rare. Strict disinfection of the machines is advocated before moving them from one area to the next.

KVASHNINA (Mme E. S.) & ETMISHEVA (Mme Z. S.). Изучение фунгисидных свойств сульфидов (сероводород, сернистый шлак) и разработка способа их применения для обеззараживания семян. [Studies on the fungicidal properties of sulphides (hydrogen sulphide, sulphurous slag) and elaboration of methods for their use in seed disinfection.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 416–419, 1936.

The results of field experiments in 1935 in different localities of the Azoff-Black Sea region confirmed the efficacy of hydrogen sulphide [*R.A.M.*, xv, p. 670] in the control of wheat bunt [*Tilletia caries* and *T. foetens*], barley covered smut [*Ustilago hordei*], loose smuts of millet [*Panicum miliaceum*], wheat, barley, and oats [*U. panici-miliacei*; ibid., xv, pp. 786, 787; *U. tritici*, *U. nuda*, and *U. avenae*]. Exposure of sufficiently dry seed-grain to atmospheres containing 400 gr. (liquid) hydrogen sulphide per cu. m. for 72 hours did not adversely affect either

the germinability of the seed or the yield of the ensuing crops. With damp seed-grain, the germinability of which was reduced by hydrogen sulphide, almost equally good control without undue injury to germinability and with comparatively slight reduction of stands was obtained by mixing the seed with granulated blast-furnace slag at the rate of 4 to 5 kg. per cu. m. of the enclosed space.

Nemiritzky (B. G.), Polyakoff (I. M.), & Lobik (V. I.). Новые протравители. [New seed disinfectants.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 461–464, 1936.

In laboratory tests a dust consisting of clay with 10 per cent. naphthenic acid was as effective in controlling wheat bunt (*Tilletia tritici*) [*T. caries*] as copper or iron naphthenates adsorbed on clay or talc, indicating that the toxic principle in the preparations is naphthenic acid. Treatment of wheat grain with the dust, at the rate of 1 gm. per kg. increased the percentage germination from 94 to 98, and also improved the germinative energy. The naphthenic acids are further stated to be highly toxic to parasitic fungi of the genera *Ascochyta*, *Alternaria*, and *Colletotrichum*, and their use for the disinfection of flax seeds is being actively studied since they exert no gelatinizing action on the seed; acidol [*R.A.M.*, xv, p. 785] (the technical product of naphthenic acids) adsorbed on clay has also shown good promise as disinfectant for flax seed.

Spangenberg (G. E.) & Gutner (L. S.). Изучение расового состава твердой головни Пшеницы (**Tilletia levis Kühn** и **Tilletia tritici Wint.**) в полевых условиях. [Investigation in the field of the physiological races constituting Wheat bunt (*Tilletia levis* Kühn and *T. tritici* Wint.).]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp 489–491, 1936.

Studies carried out in 1935 in the region of Leningrad of wheat bunt material collected from different areas of the U.S.S.R. showed the existence there of a number of distinct physiological forms of the organisms, differing in their morphological details and also in their reactions on four differential wheat varieties [*R.A.M.*, xv, p. 287]. Morphologically the authors distinguish five forms of *Tilletia tritici* [*T. caries*], namely, dark brown, light brown, typical, whitish-brown, and spiculate, and three of *T. levis* [*T. foetens*], namely, dark brown, light brown, and greyish-brown; a fourth form, considered to be a new variety, for which the name *T. levis* var. *arenaria* Spangb. is suggested [without a Latin diagnosis], was found to be widespread in Uzbekistan and Kazakstan [central Asia]; it differs from the other forms of *T. foetens* in its sandy-brown colour, and in the smaller dimensions of its spores (average 18·1 by 15·2 μ as against 19·3 by 16·1 μ).

Martin (J. F.). **Reaction of Wheat varieties to composites of races of bunt occurring in the Pacific North-west.**—*J. Amer. Soc. Agron.*, xxviii, 8, pp. 672–682, 1936.

Of 250 wheat varieties tested in 1934 at Pendleton, Oregon, for their reaction to a local and a Pacific Northwest composite of bunt, the former consisting almost exclusively of *T. tritici* [*T. caries*] and the

latter containing both this organism and *T. levis* [*T. foetens*: *R.A.M.*, xv, p. 633], the soft red winter Hussar×Hohenheimer selection (C.I. 10068–1) was the most resistant, contracting only 0·9 and 0·3 per cent. infection, respectively, from the local and Northwest forms. Among the hard red winter types Oro, Yogo, Ashkof, and Ridit were the most resistant, responding by 1·3, 4·5, 5·3, and 4·5 per cent. infection, respectively, to inoculation with the local composite, the corresponding figures for the Northwest being 0·4, 3, 7, and 18·9, respectively. Several other varieties, e.g., Minturki, were highly resistant to the local composite but not to the Northwest (2·1 and 61·3 per cent., respectively). The most resistant of the commercial hard red spring varieties to the local composite were Garnet and Ruby (67·8 and 38·7 per cent. infection, respectively), while in the soft red winter (commercial) group the best results were obtained with Odessa (25·1). None of the commercial whites showed outstanding resistance, Quality, White Odessa, and Axminster being the least susceptible (33, 49·8, and 55·5 per cent. infection, respectively). Among the Clubs Albit and Hymar were the only commercial varieties showing any promise in this particular (21·1 and 43·1 per cent. local bunt, respectively). Golden Ball and Marouani were the most resistant of the durums (local 12·4 and 55·2, Northwest 29·3 and 47·7 per cent., respectively). Alaska (poulard) and White Polish were highly susceptible and Vernal (emmer) slightly resistant; the amphidiploid wheat×rye, on the other hand, was very resistant to both local and northwest composites (1 and 1·8 per cent. infection, respectively), but the transfer of this character to an agronomically desirable wheat type is attended by numerous complications.

Most of the late tillers produced in response to warm spring temperatures by the durum wheats were bunted, even where the heads on the early-formed tillers were healthy. The tendency for late tillers to contract bunt was also observed in other semi-resistant varieties.

Schnellhardt (O.) & Heald (F. D.). **The spore load of market Wheat.** —*Trans. Amer. micr. Soc.*, lv, 3, pp. 281–285, 2 figs., 1936.

Twenty-four samples of market wheat of the 1933 crop, secured from two organizations and a number of warehouses in Washington, were washed in distilled water in a specially constructed aspirator test-tube, and their load of spores (generally excluding those of *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetens*]) determined by plating out unit volumes of the wash water from each sample on 2 per cent. dextrose potato agar in quadruplicate plates and counting the number of colonies developing.

Fungi belonging to eight genera were isolated, viz., *Alternaria*, *Aspergillus*, *Cladosporium*, *Dematium*, *Fusarium*, *Mucor*, *Penicillium*, and *Stemphylium*, *Cladosporium* and *Penicillium* being of most frequent occurrence [cf. *R.A.M.*, xiii, p. 363]. *C. malorum* [ibid., xi, p. 310] was detected in 20 out of the 24 samples examined, constituting 8·3 to 100 per cent. of the total fungal population (70 per cent. in 14). One sample of Federation yielded a spore load of 2,771 per grain, all *Penicillium*. A sample of Baart, besides harbouring 65,250 bunt spores per grain, determined by the Levy cell method, bore a load of 29 spores including *Cladosporium*, *Aspergillus*, and *Penicillium*.

Petch (T.). **Gibberella saubinetii (Mont.) Sacc.**—*Ann. mycol., Berl.*, xxxiv, 3, pp. 256–260, 1936.

The author shows that the fungus causing scab on cereals widely known as *Gibberella saubinetii* (Mont.) Sacc. is not the species originally described by Montagne as *Gibbera saubinetii* in Syll. Crypt., p. 252, 1856, a specimen of which is preserved in Herb. Kew. Montagne's fungus had already been described in 1848 by Desmazières as *Sphaeria cyanogena* (= *Gibberella cyanogena* (Desm.) Sacc.) on decaying cabbage stalks and is now known to occur as a saprophyte on various herbaceous stems and also on elm, elder [*Sambucus niger*], and broom [*Cytisus scoparius*]. Apparently Saccardo first assigned the name *G. saubinetii* to the fungus on cereals but Shear and Stevens have pointed out [*R.A.M.*, xv, p. 118] that the latter is the same species as that named by Schweinitz *Sphaeria zeae*. Accordingly the fungus causing scab of cereals must be known as *G. zeae* (Schw.) Petch.

Blin (H.). **À propos du piétin du Blé. L'action du soufre et du superphosphate.** [On foot rot of Wheat. The action of sulphur and of superphosphate.]—*J. Agric. prat., Paris*, N.S., c, 31, pp. 94–95, 1936.

After an allusion to the beneficial effects of sulphur on foot rot of wheat [*Cercosporella herpotrichoides* and *Ophiobolus graminis*: *R.A.M.*, xv, p. 782], the writer cites examples of the deleterious action of superphosphate (notwithstanding recent evidence to the contrary [ibid., xv, p. 288]) on the course of the disease.

Oort (A. J. P.). **De oogvlekkenziekte van de granen, veroorzaakt door Cercosporella herpotrichoides Fron.** [The eye spot disease of cereals caused by *Cercosporella herpotrichoides* Fron.]—*Tijdschr. PlZiekt.*, xlii, 7, pp. 179–210; 8, pp. 211–234, 5 pl., 1 fig., 1 graph, 1 map, 1936. [English summary.]

Wheat and barley are stated to be liable to severe damage in Holland from the attacks of *Cercosporella herpotrichoides* [*R.A.M.*, xv, pp. 709, 783], formerly attributed to *Ophiobolus herpotrichus* and confused with *O. graminis* [ibid., x, p. 446]. The disease, locally known as 'eye spot' from the characteristic elliptical, dark-bordered lesions extending up the leaf sheaths from soil-level, is particularly severe on clay and sandy clay soils in maritime districts and along river banks.

The above-mentioned eye spots appear in November or December on wheat sown in September or October, and by the following spring several tillers may have been killed. The lesions on the surface of the leaf sheaths bear small, black mycelial patches. In the later stages the typical features of eye spot are apt to become obscured and the general appearance of the plants resembles that produced by *O. graminis*. Secondary fungi associated with *C. herpotrichoides* include species of *Fusarium*, *Pencillium*, *Cladosporium*, *Pestalozzia*, and miscellaneous organisms of no economic importance. Lodging develops from early June onwards and is accompanied by a basal cracking of the haulms, producing large, brown lesions on rye and sometimes also on wheat in sandy soils.

Cercosporella herpotrichoides was readily isolated from wheat, barley, rye, *Alopecurus myosuroides* [*A. agrestis*], *Poa pratensis*, and *Apera spica-venti* and inoculated with positive results into wheat, barley, oats, rye, and a number of grasses. Under field conditions, however, oats are very highly resistant and rye virtually immune. Winter wheat is much the most susceptible crop, followed by winter barley. Various strains of the fungus were differentiated on the basis of mycelial coloration and other cultural characters. *C. herpotrichoides* is a relatively slow-growing fungus with an optimum temperature at 20° to 23° C., minimum −5°, and maximum above 28°. Spore formation occurred on thin layers of potato stem or malt agar, the process being apparently favoured by alternating low (−3°, 0°, and 3°) and moderate (10°) temperatures.

The results of inoculation tests with strains Sp (? from wheat: sent by R. Sprague, U.S.A.) [ibid., xiv, p. 230]; C (Zealand), E (Groningen), F (France), and H 1 (Guelderland), all from wheat, showed marked differences in virulence to the individual hosts, strain Sp infecting wheat but not grasses or oats, C infecting oats and grasses but only causing negligible attack on wheat, while E, F, and H 1 all infect wheat, oats, and grasses.

Sand culture experiments (details of which are reserved for future publication) showed that the development of *C. herpotrichoides* is promoted by phosphorus and nitrogen deficiency, which reduced the grain yield by 100 per cent. as compared with an average diminution of 25 per cent. in inoculated plants receiving a normal supply of nutrients. The grain and straw yields of Carstens V winter wheat were augmented by the application to the light soil of calcium cyanamide (275 or 350 kg. per hect.) in November and February.

Generally speaking, there are no marked differences in varietal reaction to *C. herpotrichoides* in the winter wheats commonly grown in Holland, though Queen Wilhelmina and Hohenheim may be ranked as moderately resistant. However, in a test conducted by Mayer Gmelin in 1935, seven varieties, including Juliana and Carstens V, showed only 10 to 20 per cent. lodging due to the fungus, while 30 to 40 per cent. was observed in Wilhelmina and three others, and 50 to 60 per cent. in five. While early winter sowing increases the risk of infection, there is no certainty that late plantings will escape the disease or give larger yields than the early ones.

C. herpotrichoides was isolated from a soil suspension and it is thought that the soil constitutes the primary source of infection [ibid., xv, p. 709]. The fungus is harboured by diseased stubble, which is not, however, an important source of contamination in practice; the same applies to wild grasses.

Too frequent successions of wheat and barley should be avoided as contributing to increased virulence on the part of the fungus, but both these crops may safely be preceded in Holland by peas or clover, while oats are not unfavourable. Rispens (*LandbBl., Groningen*, xvii, 4, 1935) found that shallow sowing indirectly diminishes the incidence of eye spot by producing vigorous plants with flat tillers, while shallow ploughing (contrary to the advice of certain German workers [*R.A.M.*, xiv, p. 748]) is recommended by other Dutch investigators. Vernalization

[ibid., xv, p. 785] effectively combated eye spot in Juliana wheat, but this mode of control is impracticable under Dutch conditions.

Janova [Yanova] (Mme N.). Характеристика паразитических свойств некоторых фузариумов на Пшенице по количеству аминного азота. [Determination of the parasitic properties of some *Fusarium* species parasitizing Wheat by their amine nitrogen production.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 496–498, 1936.

The results of the work summarized in this paper confirmed the diagnostic value of amine nitrogen production by species of *Fusarium* in relation to their pathogenicity [*R.A.M.*, xv, p. 456], and showed that this relationship holds true even between strains of one and the same species. Thus, of three strains of *F. avenaceum* collected from three different regions of the U.S.S.R., the most virulent (from the Leningrad area) accumulated 0·33 mgm. amine nitrogen per unit of weight, while the other two produced 4·6 and 4·7 mgm., respectively. Of three strains of *F. graminearum* [*Gibberella saubinetii*], the two most virulent accumulated 4·4 and 8·4 mgm., respectively, while the third, a weak parasite, produced 18·4 mgm. amine nitrogen.

Pohjakallio (O.). **Valkotähkäisyystutkimuksia Jokioisissa kesällä 1935.** [Investigations on white ear conducted at Jokioinen in the summer of 1935.]—*Valt. Maatalousk. Julk.* 77, 78 pp., 17 figs., 2 diags., 1936. [Finnish, with German summary.]

White ear [*R.A.M.*, viii, p. 304; xv, p. 355] of cereals and grasses was limited in 1935 in the Jokioinen district of Finland to certain well-defined areas, such as dry slopes and the banks of ditches, where the affected species included *Alopecurus pratensis*, *Phleum pratense*, *Festuca pratensis*, and *Poa trivialis*. These grasses suffered from the so-called 'total' form of the disease, in which the ears turn pale and die without impairing the vitality of the rest of the plant, but in the case of cereals the symptoms were only partial. Many factors are involved in the etiology of the disease. A definite etiological relationship was established between *Mastigosporium album* [ibid., viii, p. 301] and white ear in *A. pratensis*, the discoloured internal tissues of the haulm and leaf sheath of which contained the hyphae of the fungus. Water shortage was shown to be largely responsible for partial white ear in *A. pratensis*, *P. pratensis*, and *Phleum pratense* [ibid., x, p. 490]. In oats (Pelso variety) and summer wheat the condition was experimentally induced by deficiency of nutrient materials, while both excess and absence of shade seemed to favour the disorder in oats. White ear symptoms may also develop as a sequel to pressure and friction between the haulm and leaf sheath, which lead to curvature and rupture in the meristematic growth zone of the haulm, and to attacks by mites (*Pediculopsis graminum*) and other insects.

Markhasseva (Mme V. A.). Методика прогноза развития спорыньи (**Claviceps purpurea Tul.**). [A method for the prognosis of the development of ergot (*Claviceps purpurea* Tul.).]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 535–537, 1936.

A summary is given of observations made in 1935 in the Leningrad

and Kieff regions, greatly differing from one another in environmental conditions, with a view to determining the factors most favourable for the initiation and development of rye ergot (*Claviceps purpurea*). The evidence indicated that the ergot sclerotia in the soil germinate in the spring at a minimum temperature slightly above 10° C. and most freely at soil moisture content round about 22 per cent. The most vigorous development of the perithecial stromata occurred at soil temperatures of 17·3° to 21·2° and with soil moisture of 15 or 16 per cent.; higher temperatures and lower soil moisture tended to delay their development. In the north the development of asci in the perithecial heads began eight days and in the south five days after the emergence of the stromata from the soil, and ascospore discharge began on the 15th day in the north and on the 7th day in the south. In the Kieff region the discharge of the ascospores coincided with the end of the blossoming stage of the early rye sowings, later crops being in full bloom at that time. Infection in 1935 was not abundant in the neighbourhood of Kieff, owing to high air temperatures and low air humidity.

Field observations near Kieff indicated that 100 per cent. of the larger ergot sclerotia fall out of the ears at commercial maturity of the rye; 80 per cent. of the medium-sized sclerotia also drop out, but all the smaller sclerotia are retained in the ears. While these results are admittedly only preliminary, it is hoped that further studies on these lines may eventually provide data on which further outbreaks of the disease may be forecast with some degree of accuracy.

Barnette (R. M.), Camp (J. P.), Warner (J. D.), & Gall (O. E.). **The use of zinc sulphate under Corn and other field crops.**—*Bull. Fla agric. Exp. Sta.* 292, 51 pp., 14 figs., 1936.

After briefly describing the symptoms of 'white bud' of maize [*R.A.M.*, xiv, p. 576] in Florida, the authors give a detailed and fully tabulated account of experiments, the results of which showed that the severity of the disease may be materially reduced by fallowing the affected soils for one or two years. With soils on which the disease had been severe for several years, the application (in the row) of 10 to 20 lb. of 89 per cent. zinc sulphate per acre, in conjunction with the separate application of a complete inorganic fertilizer (nitrate of soda, superphosphate, and muriate of potash), gave the best control of white bud and considerably increased the yield in grain. The efficacy of a dressing with nitrate of soda alone or urea in addition to superphosphate and muriate of potash was increased, especially in the case of the latter, by the application of zinc sulphate in the row before sowing maize.

Pathological symptoms were also observed on velvet bean [*Mucuna deeringiana*], cowpea, and pearl millet [*Pennisetum typhoides*] plants grown on soil deficient in zinc, but were absent from plots receiving zinc sulphate in the row before planting. While no symptoms occurred on groundnuts, oats, sugar-cane, Napier grass [*P. purpureum*], *Crotalaria spectabilis* [*C. sericea*], and *C. intermedia* grown on land producing white bud in maize, their yield was definitely increased by the application of zinc sulphate before planting.

Wagner (F. A.). **Reaction of Sorghums to the root, crown, and shoot rot of Milo.**—*J. Amer. Soc. Agron.*, xxviii, 8, pp. 643–654, 4 figs., 1936.

A description is given of the root, crown, and shoot rot of milo sorghums due to *Pythium arrhenomanes* [*R.A.M.*, xv, p. 435], which occurs in Kansas, Texas, New Mexico, and possibly California and Oklahoma. Adjustments in the ordinary methods of cultivation, crop rotation, and the like, are powerless to combat the disease, and attention has therefore been directed to the development of resistant varieties. A table shows the reactions to the fungus of a large number of standard varieties, selections, and crosses tested during the period from 1930 to 1934. Among the most susceptible were Pygmy (Two-Foot) milo (C.I. 480×C.I. 332) 45–134, Wheatland Back-cross (C.I. 918×C.I. 332) 1–2, Wheatland (C.I. 918), Early White milo (C.I. 480), darso, Sooner milo, Beaver, Day milo, and Dwarf Yellow milo, while kafirs, feteritas, and most sorgos proved highly resistant. Among the milo crosses giving promising indications in respect of resistance were Kalo, Dwarf feterita×(milo×kafir) (H.C. 312), milo×hegari, Woodward selections 13–10, 14–11, and Hays selection H.C. 282, kafir×milo, Woodward selections 38–1–2–1, 10–1–29, and 8–2–6, and Dwarf Yellow milo×Dwarf Freed, Hays selection 339. Fargo (C.I. 809) and Manko maize are the only two varieties of the Dwarf Yellow type showing natural immunity from the milo disease, a property shared by Dwarf Freed (C.I. 971), Grohoma, hegari, and Sudan grass [*Sorghum sudanense*], and apparently by the forage variety Rex sorgo. Resistant strains of the ordinarily susceptible Dwarf Yellow milo, Wheatland, and Beaver have been developed and it is hoped that seed of these selected stocks may shortly be available for distribution.

Speroni (H. A.). **Argentine Republic : further contribution to the study of the disease known as 'podredumbre de las raicillas' [rootlet rot] of Orange trees.**—*Int. Bull. Pl. Prot.*, x, 8, pp. 169–170, 1936.

An account has already been given of an orange disease in Bella Vista, Corrientes, Argentine Republic, characterized by general stunting, chlorosis, or foliocellosis (veins yellow, interveinal parts green or vice versa), a rosette-shaped arrangement of the abnormally small leaves, and disorganization of the fine rootlets [*R.A.M.*, xiii, p. 436; xv, p. 716]. The disorder is believed to be of physiological origin, being favoured by the presence in the acid local soils of excesses of iron and aluminium salts and various cultural defects, including inadequate drainage, unduly deep planting, lack of green manures, and soil exhaustion through repeated cropping. Beneficial results were obtained in 90 per cent. of the cases treated by the injection of 10 per cent. iron sulphate at the rate of 10 c.c. (or insertion as crystals), followed by the application of slaked lime (3 to 4 kg. per tree). Satisfactory control was also given by liming as indicated and watering the trees with a solution containing 250 to 300 gm. iron sulphate at the rate of 20 l. per tree [ibid., xv, p. 496].

Perlberger (J.). **Phytophthora stem and tip blight of Citrus seedlings.**—Reprinted from *Hadar*, ix, 6–7, 23 pp., 9 figs., 1936.

In the winter of 1932 sweet lime [*Citrus limetta*] seedlings in Palestine

developed a brown or black blight, usually beginning at the growing point and spreading to the leaves and main stem. Sometimes it started lower down the stem, spreading first to the lower leaves and later to the higher ones. Usually, but not invariably, the root and root-collar remained unaffected. The infected material showed the presence of *Phytophthora parasitica* and *P. citrophthora* [cf. *R.A.M.*, xv, p. 575] (rarely found together) and, occasionally, of two unidentified species of *Phytophthora*.

Inoculations of wounded and unwounded sweet lime and sour orange seedlings with isolations of *P. parasitica* and *P. citrophthora* gave negative results, though successful infection was obtained on the fruits. In attempts to secure infection through soil, 100 sweet lime seeds from healthy fruits were sown in pots on sterilized soil, inoculated with the two organisms. Of the two cultures of *P. citrophthora* used one gave a small and the other a high percentage of healthy seedlings, and a similar result was obtained with *P. parasitica*; this variation in virulence of the cultures is thought to be due to attenuation. The results of the inoculation experiments indicate that a large part of the seeds from fruit infected with *P. citrophthora* or *P. parasitica* is killed inside the fruit, that many of the remainder rot in the earth before germinating, and some become infected shortly after germination. Observations showed that sour orange is highly resistant to *Phytophthora* infection.

Control measures recommended are the use of seed from whole, healthy fruits picked from the tree, disinfection of the seed-bed soil with a 1 in 100 formaldehyde solution, treatment of the seed with uspulun or ceresan 1 in 1,000 for 30 minutes, the use of cold seed-beds of low humidity, and spraying the seedlings within a week after germination with 0·5 per cent. Bordeaux mixture, the application being repeated at double strength 10 days later. All infected seedlings should be removed.

Malençon (G.). **Données nouvelles sur le bayoud.** [New data on baïoud disease.]—*Rev. Mycologie*, N.S., i, 4, pp. 191–206, 5 pl., 1 map, 1936.

The author's observations lead him to consider that epidemic outbreaks of baïoud disease (*Fusarium albedinis*) of the date palm [*R.A.M.*, xiv, p. 302] in Morocco are due to temporary environmental factors acting upon infections long present in an attenuated form. Thus, a severe attack occurred a few years ago in an arid locality following a wet year, in which the natives, who leave the trees untouched as long as they are unproductive, had resorted to drastic pruning. In palms deprived of water, the disease develops very slowly and the symptoms so much resemble those of drought that they usually escape attention. But when the water deficiency is suddenly rectified, the activity of both host and pathogen is stimulated, and numerous previously tolerant individuals, wrongly regarded hitherto as unaffected, are killed off. That this outbreak continued to spread indicates, in the author's opinion, the presence of a more virulent strain of the fungus, developed in response to the increased resistance offered by the trees during drought, and to the effect of the drought on the fungus itself.

Repeated laboratory tests showed that in dry conditions micro-

conidial production by *F. albedinis* is reduced and the formation of macroconidia stimulated, and that colonies derived from the latter show renewed vigour. If, therefore, sudden moisture favours conidial production by a fungus that has retained a high degree of virulence, and at the same time the trees are subjected to drastic pruning, conditions favourable to an epidemic outbreak are produced. As the epidemic spreads, microconidia are continually produced, and virulence is reduced, as indicated by laboratory tests. The epidemic gradually declines until a balance is reached between the factors affecting the attack, at which point the disease assumes the slow, latent form in which it is generally present.

A further geographical survey showed conclusively that in Morocco baïoud is strictly confined to those regions which possess a typical Sahara climate, unaffected by maritime influences.

Kapshuk (A. A.). Испытание сернистых соединений на группе бактерий, возбудителях гнили овощей и пятнистости Табака, Фасоли, Пшеницы и гоммоза Хлопчатника. [Tests of the toxicity of sulphur compounds to the group of bacteria causing rots of vegetables and spotting of Tobacco, French Beans, and Wheat, and gummosis of Cotton.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 517–518, 1936.

Field experiments in 1934 in North Caucasus showed, *inter alia*, that cotton seed naturally infected with *Bacterium malvacearum*, which was exposed for 72 hours to an atmosphere containing 750 gm. hydrogen sulphide [see above, p. 26] per cu.m. enclosed space, gave rise to plants that showed only 1·25 per cent. gummosis, as against 18 per cent. in the crop from untreated seed; formalin (1 in 100) treated seed gave 1 per cent. infection at the same stage. Hydrogen sulphide caused a serious discoloration of the two cotyledonary leaves at first, but on the whole had a stimulatory effect on the growth of the plant.

Krug (H. P.). **A podridão interna dos capulhos do Algodeiro no estado de São Paulo.** [Internal boll rot of Cotton in the State of San Paulo.]—*Bol. techn. Inst. agron. Campinas* 23 (I), 19 pp., 1 col. pl., 1936.

A summary is given of the available information on the history, host range, distribution, economic importance, symptoms, and etiology of internal boll rot of cotton (associated with bacteria, *Nematospora coryli*, *N. gossypii*, yeasts, and *Penicillium* sp.) [*R.A.M.*, xv, p. 437], which was recorded during 1936 from six Experimental Stations in San Paulo, Brazil, viz., Santa Elisa, Pindorama, Riberião Preto, Tatuhy, Tietê, and Tupy, causing 1·5 to 8 per cent. infection. Of the above-mentioned agents, bacteria appear to be the most active in the causation of the disorder, which is transmitted by *Dysdercus* spp. and other sucking insects. In this way infection is conveyed to various wild and cultivated Malvaceae, such as *Sida* and *Hibiscus*, and so perpetuated. *N. coryli* was isolated at Campinas from cowpeas, from which it may be transmitted to cotton by *Nezara viridula*.

Hopkirk (C. S. M.). **Paspalum staggers.**—*N.Z. J. Agric.*, liii, 2, pp. 105–108, 2 figs., 1936.

In April, 1935, cattle in two localities in New Zealand became affected with a form of staggering when grazing on seeding paspalum [*Paspalum dilatatum*] infected with ergot (*Claviceps paspali*). Although paspalum ergot does not appear to have been present before in New Zealand [cf. *R.A.M.*, xv, p. 809], by 1936 all the stands in North Island were visibly affected.

Linton (E.). **A fungoid parasite in the kidney of the Butterfish (Poronotus triacanthus).**—*Trans. Amer. micr. Soc.*, lv, 1, pp. 93–96, 1 pl., 1936.

In 1913, while examining butterfish (*Poronotus triacanthus*) for helminth parasites at Woods Hole, Massachusetts, the writer detected in the kidney about 100 thin-walled cysts, 3 to 5 mm. in diameter, containing branching structures, frequently terminating in knob-like enlargements, 0·5 to 0·8 mm. in diameter, and consisting of a readily stainable granular protoplasm, enclosed in a thin, very lightly staining investment. This is composed of two layers, the outer loose, fibrous, readily detachable, often appearing as a yellowish mass lying along the débris of the crushed cyst, the inner thin and closely adhering to the granular material. Similar observations were made on subsequent dates in the same year and again in 1914. No definite place in any taxonomic group has yet been assigned to the organism, but an affinity with the Basidiomycetes has been suggested.

Pospeloff (V. P.). Результаты работ лаборатории болезней насекомых по разработке микробиологического метода борьбы с вредными насекомыми. [Results of the work accomplished by the Laboratory for Insect Diseases in the development of a system for the microbiological control of harmful insects.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 318–321, 1 fig., 1936.

The author states that experiments in 1934 in the neighbourhood of Leningrad and in the Moldavian Soviet Republic showed that in both regions excellent control of the cabbage and turnip butterflies [*Pieris brassicae* and *P. rapae*] was obtained by spraying the host plants with a suspension of Métalnikov's bacillus [*R.A.M.*, xv, p. 292], which is said to belong to the *Bac.* [*Bacterium*] *pirenei* type. In the laboratory the bacillus killed up to 100 per cent. of the maize borer larvae [*Pyrausta nubilalis*], but in the open it only caused 40 to 45 per cent. mortality of the larvae on experimental maize plants and 35 per cent. in commercial maize fields; the yield of the treated field plots was increased by 32·2 per cent. It was further observed that in the sprayed maize plots the amount of smut (*Ustilago maydis*) [*U. zeae*] was reduced by 75 per cent. and laboratory tests showed that the bacillus brought about the complete lysis of the *U. zeae* spores. Likewise, in paired cultures the bacillus completely suppressed the growth of a *Fusarium* species which was isolated from decayed soy-beans. These results indicate the eventual possibility of using Métalnikov's bacillus for the control of certain pests and parasitic fungi, the more so as the organism is innocuous to man and higher animals.

Cephalosporium lecanii [ibid., xiv, p. 305] was found to be very widespread on scale insects of citrus along the whole coast of the Black Sea, and was frequently isolated from species of *Pulvinaria*, *Coccus*, *Saissetia*, *Ceroplastes*, *Lecanium*, and *Eucalymnatus*, in the natural control of which it evidently plays a considerable part. Isolations from *Aonidiella aurantii* scales yielded an unidentified species of *Cladosporium*, and another species of this genus was found causing a heavy epidemic among *Pseudococcus citri* in citrus hothouses in Leningrad in 1934. A strain of *Bacillus prodigiosus* and a species of *Blastodendrion* both isolated from unspecified scale insects were experimentally proved to be pathogenic to other insects of the same kind. *Metarrhizium anisopliae* [ibid., xv, p. 499] was isolated from dead larvae of the rhinoceros beetle, *Spicaria fumoso-rosea* [ibid., ix, p. 309] from dead larvae of *Agrotis exclamationis*, *Botrytis tenella* [? *Beauveria* sp.: cf. ibid., i, p. 355; vi, p. 481] from dead cockchafer larvae, and *Beauveria* sp. and *Sorosporella* from dead larvae of *A. segetum*.

Faes (H.). **La préservation des plantes cultivées. D'une part, par la protection des auxiliaires naturels; d'autre part, par l'élevage et la multiplication d'animaux et végétaux ennemis des déprédateurs et parasites.** [The preservation of cultivated plants: on the one hand, by the protection of natural adjuncts, and on the other, by the breeding and propagation of animal and vegetable enemies of pests and parasites.]—*Annu. agric. Suisse*, xxxvii, 7, pp. 759–773, 1936.

The possibilities of combating plant pests by the protection or, where necessary, the introduction and propagation of their natural enemies (insects and fungi) are discussed in relation to the climatic conditions governing the development both of the controlling agents and of the pathogens to be eliminated.

Williams (J. W.). **II. Effect of variation of ratios of dextrose to peptone on colonies of certain pathogenic fungi.**—*Arch. Derm. Syph., Chicago*, xxxiv, 1, pp. 15–34, 1936.

Continuing his studies on the effect of variation in the ratios of dextrose to peptone on the colonies of a number of human pathogenic fungi [*R.A.M.*, xv, p. 294], the writer fully discusses this phenomenon in relation to the physico-chemical characteristics of the medium—surface tension, osmotic pressure, and viscosity. A substratum consisting of 4 per cent. peptone, 1 per cent. dextrose, and 1·5 per cent. agar, at a P_H range from 5·2 to 8 has been found very useful in stabilizing the morphological characters of the fungi under observation and thereby assisting in their classification. Pigment production has also been used as a basis of differentiation. Great importance is attached to the correlations between physico-chemical features of the media (e.g., surface tension, as measured by an interfacial tensiometer, and osmotic pressure) and the morphology of the colonies.

Emmons (C. W.) & Carrión (A. L.). **Hormodendrum pedrosoi. An etiological agent in chromoblastomycosis.**—*Puerto Rico J. publ. Hlth*, xi, 4, pp. 639–650, 6 pl., 1936. [Spanish translation on pp. 651–662.]

The fungus responsible for most cases of chromoblastomycosis in

South America and Porto Rico is *Hormodendrum pedrosoi* Brumpt 1922 (syn. *Acrotheca pedrosoi*, *Trichosporium pedrosoi*, and *T. pedrosianum*) [*R.A.M.*, xv, pp. 720, 804 and next abstract]. The affinities of the pathogen with the saprophytic representatives of the genus are shown by its similar but slower growth habit, its characteristic greenish-grey to olive-black pigmentation on Czapek's and Sabouraud's maltose agars, and its production of branching chains of conidia, which excludes it from either *Acrotheca* or *Trichosporium*. The conidial dimensions vary greatly according to their position on the chains, those at the base measuring 7 to 10 (up to 13) by 2·5 to 3·5 μ and those at the tip 3 to 5 by 1·5 to 3 μ. The conidia are borne in heads of five more or less overlapping types. The subterminal elements of the chains are true spores and not parts of the conidiophore, as shown by their mode of development, transitional forms, and ready germination. The so-called 'disjunctors' (narrowed spore ends and the surrounding thickened walls) are present in *H. pedrosoi* as well as in the saprophytic species of the genus, while in common with at least one of the latter it occasionally forms conidiophores and conidia of the *Phialophora verrucosa* type. Successful animal (rat) inoculations with saprophytic species of *Hormodendrum*, e.g., *H. elatum*, corroborate the evidence already presented for a close relationship between the parasitic and saprophytic members of the genus.

Emmons (C. W.) & Carrión (A. L.). **The Phialophora type of sporulation in Hormodendrum pedrosoi and Hormodendrum compactum.**—*Puerto Rico J. publ. Hlth*, xi, 4, pp. 703–710, 5 pl., 1936. [Spanish translation on pp. 711–719.]

Fifteen strains of fungi from cases of chromoblastomycosis were studied, twelve being assigned to *Hormodendrum* and three to *Phialophora*. In all the strains of *H. pedrosoi* [see preceding abstract] and *H. compactum* investigated, the *Phialophora* type of sporulation was observed, a fact considered to demonstrate the close relationship existing between the three agents of chromoblastomycosis. The *Phialophora* type of conidiophore in *Hormodendrum* may arise through a modification of one or two conidia in an otherwise typical *Hormodendrum* head, or it may appear as an isolated lateral or terminal branch at a variable distance from the *Hormodendrum* conidiophores. Aberrant strains of both *H. pedrosoi* and *P. verrucosa* were observed, but the authors are not inclined to attach great taxonomic significance to this phenomenon.

Moore (M.). **Chromomycosis.**—*Folia biol., B. Aires, 1936*, 61–65, pp. 266–269, 1936. [Spanish translation.]

Chief among the fungi responsible for chromomycosis in South America is *Botrytoides pedrosoi* (Brumpt) Moore & Almeida [*R.A.M.*, xv, p. 720, and cf. preceding abstracts] stated to be characterized chiefly by the conidiophores which may be single, simple or branched, successive, terminal, lateral, or intercalary. *Phialophora verrucosa* has been reported from Uruguay in this connexion [ibid., xiv, p. 509] and one of the fungi found by Pedroso and Gomes in 1920 to be associated with the disease has been recognized as a new species, *P. macrospora* Moore & Almeida.

The *Hormodendrum* isolated from authenticated cases of chromoblastomycosis in Brazil and referred by Langeron to *Trichosporium pedrosoi* [ibid., viii, p. 645] is stated to have the properties both of this genus and *Botrytoides* and should therefore be placed in a new genus for which the name *Hormodendroides* is proposed [without a Latin diagnosis]. The genus *Phialoconidiophora* has the cup formation of *Phialophora*, the conidiophores of *Botrytoides*, *Hormodendroides*, and *Hormodendrum* and a peculiar 'cup' formation on conidiophores of the *Hormodendrum* type, while each of the other four genera shows a more or less complete loss of these characters. In the affected tissues, the cells are apparently similar for all the five genera, the representatives of which it is concluded may produce the disease.

Langeron (M.). & Baeza (M.). **Sur les dermatophytes qui causent la teigne faveuse humaine.** [On the dermatophytes which cause human faviform ringworm.]—*Ann. Parasit. hum. comp.*, xiv, 4, pp. 395–402, 6 pl., 1936.

As a result of their studies on the organisms isolated from 304 cases of human favus in the Spanish Protectorate of Morocco the authors differentiate, as foreshadowed in a previous communication [*R.A.M.*, xiv, p. 102], six different types, viz., *Achorion schoenleini* [ibid., xv, p. 579], and five new species named [without Latin diagnoses] *A. pittalugai*, *A. talicei*, *A. debueni*, *A. brumpti*, and *A. milochevitchi*, respectively. While all these species are generally characterized by more or less glabrous colonies on Sabouraud's medium, *A. schoenleini* on this medium produces a strictly superficial, spongy, irregular growth which does not apparently develop below the surface, while the four next-named give a rather adherent growth, slightly penetrating the surface of the medium, and the last-named chiefly develops below the surface, where the growth is radiating and regular. Apart from these growth differences, the species differ from one another in the number, disposition, and nature of the organs that develop in polysaccharide media, such as 'chandeliers faviques', which are interpreted as modifications of the mycelium due to unsuitable medium; catenulate and single chlamydospores, which like the aleuria are present in some species; and nodules, which may be agglomerations of conjugating hyphae. True spindles were not found, the spindle-like structures that were observed possibly being either aborted spindles or large fusiform chlamydospores.

These results are considered to dispose of Sabouraud's assertion that human favus is caused by *A. schoenleini* alone, a conclusion supported by the discovery in other parts of the world of other species or varieties of *Achorion*, some of which are very reminiscent of certain forms described in this paper. They would further indicate a close botanical relationship between the genera *Achorion* and *Trichophyton* which might be reunited into one common group under Neveu-Lemaire's name *Favotrichophyton* [cf. ibid., iii, p. 597], comprising three sections: (1) for species of *Trichophyton* with endo-ectothrix megaspores (namely, *T. album*, *T. discoides*, *T. ochraceum*, *T. bullosum* [ibid., xiv, p. 103], *T. papillosum*, and *T. pruinosum*) [ibid., xiii, p. 577]; (2) for those typical of *Achorion*, including the species discussed above; and (3) for

species with endothrix spores, subdivided into section (*a*) for the microsporous forms (*T. concentricum*, *T. roquettei*, and *T. langeroni*) corresponding to *Endodermophyton*, and (*b*) for the macrosporous forms (*T. violaceum*, *T. glabrum*, and *T. gourvili* [loc. cit.]) corresponding to *Bodinia*.

Boné (G.). **Les Monilias.** [The Moniliae.]—*C.R. Soc. Biol., Paris*, cxxii, 27, pp. 803–805, 1936.

The six strains of *Monilia* isolated from human patients at Louvain, Belgium, were antigenically identical and fell into Lamb's group I, comprising *M.* [*Candida*] *albicans*, *M.* [*C.*] *psilosis*, and *M. candida* [*C. vulgaris*: *R.A.M.*, xiv, p. 444]. To the same category belonged a yeast (*Monilia*) [*Candida*] from the Institut Carnoy. The beer yeasts and wild *Torulae* examined for comparative purposes were found to contain different antigens.

Almon (Lois), Pessin (S. B.), & Stovall (W. D.). **Dietary deficiencies and resistance to infection by Monilia.**—*J. infect. Dis.*, lix, 1, pp. 54–59, 1936.

No evidence of increased susceptibility to infection by *Monilia* [*Candida*] *albicans*, *M. candida* [*C. vulgaris*], and *M.* [*C.*] *parapsilosis* [see preceding abstract] due to an inadequate dietary (deficiency of vitamins A, C, and D, excess of egg white) in rats and rabbits could be detected. All cases of pneumonia in the treated animals showing the fungi in the tissues could be duplicated in normally nourished controls. The organisms may remain for several days in the digestive tract without inducing symptoms or pathological changes. Unless the lungs are diseased, or become so, the fungi do not persist in these organs. It has not been definitely established whether any of the lung changes observed in the experimental animals were due to *C. albicans*.

Mackinnon (J. E.) & Rodriguez-Garcia (J. A.). **Mesure et comparaison du degré de virulence des champignons levuriformes.** [The measurement and comparison of the degrees of virulence of the yeast-like fungi.]—*Ann. Parasit. hum. comp.*, xiv, 4, pp. 403–407, 1936.

The results of experiments outlined in this paper showed that the species of yeast-like fungi most virulent to the rabbit are referable to Langeron's and Talice's genera *Mycotorula* and *Candida* [*R.A.M.*, xi, p. 476]; the pathogenic species of *Mycotoruloides* and *Geotrichoides* [ibid., xv, p. 368] come next in virulence, while those of *Mycocandida* for the most part are either non-pathogenic or nearly so. Of the four forms of *Blastodendrion* that were tested, three were non-pathogenic and one had an attenuated degree of virulence. All the yeast-like fungi isolated from human or animal lesions were more or less virulent to the rabbit, while those from healthy skin were non-pathogenic, and it is believed that the degree of virulence is stable enough to be used as a diagnostic character in conjunction with morphological and biological criteria.

Dillman (A. C.). **Improvement in Flax.**—*Yearb. Agric. U.S. Dep. Agric.*, pp. 745–784, 10 figs., 1936.

In this detailed account of the breeding of improved flax varieties the author reviews the progress made in the production of strains resistant to wilt [*Fusarium lini*: *R.A.M.*, xii, p. 95] and rust (*Melampsora lini*) [ibid., xv, p. 805]. He states that varieties and selections resistant when first developed become less resistant later on, or when grown in a different locality, possibly owing to the existence of different physiologic forms of the fungus. Some varieties, such as Bison, Buda, and Argentine are, however, resistant over a wide area, and are, therefore, valuable parents for breeding work.

Werneck (H. L.). **Eine neue Krankheit und ein neuer Schädling an der Weberkarde in Oberösterreich.** [A new disease and a new pest on Fuller's Teasel in Upper Austria.]—*Neuheiten PflSch.*, xxix, 4, pp. 137–138, 1936.

A number of fuller's teasel [*Dipsacus fullonum*] plants from Steyregg, Upper Austria, submitted to the Linz Agricultural Experiment Station for inspection in May, 1936, were found to be heavily infected by downy mildew (*Peronospora dipsaci*), which was reported to have destroyed extensive stands of the crop in the locality of origin.

Brown (Nellie A.). **Privet and Jasmine galls produced by a species of Phomopsis.**—*Phytopathology*, xxvi, 8, pp. 795–799, 1 fig., 1936.

A *Phoma* was isolated from nodular galls causing a severe disease of privet (*Ligustrum vulgare*) in the District of Columbia and inoculated into the same host with positive results in 50 and 60 per cent. of the outdoor and greenhouse series, respectively, the excrescences reaching a diameter of 3 cm. in 5½ months. Wounding is apparently necessary for infection. The fungus was reisolated from the diseased tissues and successfully reinoculated on privet. *L. amurense* Carr., olive, and winter jasmine (*Jasminum nudiflorum*) are also susceptible to inoculation with the *Phoma* from *L. vulgare*. In the southern States an apparently identical fungus forms finely nodular galls on winter jasmine, isolations from which produced galls on the same host and on *L. vulgare*. The privet disease also occurs in the South, where it has been erroneously attributed to *Bacterium tumefaciens* [cf. *R.A.M.*, xv, p. 782], four virulent strains of which failed to infect this plant in the writer's experiments. The *Phoma* stage is produced in great numbers in culture, but the pycnidia on galls kept for ten months at 12° C. exuded *Phomopsis* spores, including the scolecospore type, on removal from the refrigerator and moistening.

Ehrenberg (P.). **Zusammenfassende Betrachtungen zur Eisenversorgung von Kulturpflanzen.** [Comprehensive observations on the supply of cultivated plants with iron.]—*Z. PflErnähr. Düng.*, A, xlv, 1–2, pp. 1–55, 1936.

This is a comprehensive survey, supplemented by explanatory observations and copious bibliographical references, of contemporary literature on the iron requirements of cultivated plants, with special

reference to lime-induced chlorosis of lupins in Germany [*R.A.M.*, xv, pp. 373, 585].

THOMAS (L. A.). **Calcium deficiency in Apple trees at Stanthorpe (Q.).**—*J. Coun. sci. industr. Res. Aust.*, ix, 3, pp. 235–236, 1936.

To ascertain whether blotches on the leaves of Jonathan apple trees and a wine-coloured discoloration of the leaves of Gravenstein trees growing in an orchard at Stanthorpe, Queensland, were due to calcium deficiency [*R.A.M.*, xv, p. 663] the following treatments were carried out on Jonathan trees: (1) quicklime, 2 tons per acre, applied on 12th April, 1934, (2) the same, 1 ton per acre (10th July, 1934), with muriate of potash 5½ lb. per tree (2nd May, 1934), and (3) the muriate of potash application only. Other trees remained untreated as controls. In 1935–6 the blotching had practically disappeared from the lime-treated trees, while it was present to a moderate extent on the controls and was most marked on the trees given the potash. It is suggested that in the case of trees with a low calcium content, further intake of potassium accentuates the unbalanced state of the ions and so intensifies the calcium deficiency symptoms. In another orchard deficiency symptoms were pronounced on Jonathan trees which had received no lime, but barely evident on others limed six months earlier.

So far the wine colour of the leaves has not been observed on the Jonathan variety and this symptom cannot be relied upon as diagnostic of lime deficiency, especially as wine-coloured leaves on plums late in summer generally signify that the branch or tree is dying.

MCLARTY (H. R.). **Tree injections with boron and other materials as a control for drought spot and corky core of Apple.**—*Sci. Agric.*, xvi, 12, pp. 625–633, 1 fig., 1936. [French summary.]

This is a tabulated report of the preliminary results of experiments from 1932 to 1935 in British Columbia on the control of drought spot and corky core of apples [*R.A.M.*, xii, p. 769; xv, p. 446], two physiological disorders that cause serious economic losses in the Okanagan and Kootenay valleys. Injections into the trunk and main limbs of thirty different chemicals [which are listed], either alone or in combination with one another, gave significant control of both conditions only when boron was used (either as manganous borate or boric acid), at doses over 0·48 gm. boric acid per 100 sq. cm. of trunk cross-sectional area for drought spot, and over 1·83 gm. for corky core. In the 1934–5 season, the average yield of saleable fruit of boron-treated trees was increased from 3·61 to 10·6 boxes per tree, whereas on control trees it fell on the average from 3·8 to 2·5 boxes. The amounts of boric acid used (up to 5·92 gm.) did not cause injury to the foliage, but slight injury was noticed at the points of injection.

BIRMINGHAM (W. A.). **Crown gall: a warning to fruitgrowers.**—*Agric. Gaz. N.S.W.*, xlvii, 8, p. 464, 1936.

Almond and pear trees sent from a nursery to a grower in the Murrumbidgee Irrigation Area were found to be infected by crown gall (*Bacterium tumefaciens*), which is chiefly introduced into clean areas on

nursery stock. Growers are recommended to reject all stocks showing suspicious outgrowths.

Schnellhardt (O.) & Heald (F. D.). **Pathogenicity tests with Botrytis spp. when inoculated into Apples.**—*Phytopathology*, xxvi, 8, pp. 786–794, 3 figs., 1936.

Stored apples in Washington are liable to a destructive rot caused by a *Botrytis* of the *cinerea* type [*R.A.M.*, xv, p. 732] whenever the harvesting period is accompanied by considerable rain. The fungus advances more rapidly on fruit in cold storage than the agent of blue mould [*Penicillium expansum*: ibid., xiv, p. 592]. Isolations of *B. cinerea* (type) from apple and pear fruits, pea pods, dogwood [*Cornus mas*] and blueberry [*Vaccinium* spp.] twigs, geranium [*Pelargonium*] and *Gloxinia* shoots, *Feijoa* [? *sellowiana*: ibid., xv, p. 593], and guava (all in the United States), apple fruits from British Columbia and an English culture probably from the same host, and one from *Crassula perforata* (W. B. Brierley's strain producing albino sclerotia) caused a severe decay of Jonathan apples at room and storage temperatures. A higher degree of pathogenicity was manifested by recently isolated species than by those maintained for some time on artificial media. The *Botrytis* isolated from *Gloxinia* consistently produced a light red pigment in culture [ibid., v, p. 746]. *B. trifolii* [ibid., xiii, p. 520], *B. fabae* [ibid., xiv, p. 734], and *B. tulipae* [ibid., xv, p. 807] were only weakly parasitic and appear to be of little importance in apple decay. The limited data yielded by these studies are held to indicate that the grey moulds of fruits, vegetables, and ornamentals are interchangeable, in which case the first-named would obviously be exposed, in the course of packing and storage operations, to numerous potential sources of inoculum.

Brooks (C.), Bratley (C. O.), & McColloch (L. P.). **Transit and storage diseases of fruits and vegetables as affected by initial carbon dioxide treatments.**—*Tech. Bull. U.S. Dep. Agric.* 519, 24 pp., 1 graph, 1936.

In experiments on the use of carbon dioxide gas as a supplement to cold storage [*R.A.M.*, xii, p. 102; xv, p. 299], decay in sweet cherries (mostly *Rhizopus* [*nigricans*: ibid., xii, p. 378], though some was due to *Penicillium*) was retarded equally well by gradual cooling in 30 per cent. or more of the gas as by immediate storage at 32° F. With cherries inoculated with *Monilia* [*Sclerotinia*] *fructicola*, *Cladosporium* sp., and *R. nigricans*, even better results were obtained.

Decay in apricots inoculated with *S. fructicola* or *P. expansum* was retarded approximately as much by holding at 49° in 18 per cent. carbon dioxide as by storage at 34°.

In Bartlett pears inoculated with *Botrytis cinerea* decay was delayed more by the 50 and 22 per cent. carbon dioxide treatments than by storage at 32°, 10 per cent. gas treatment delaying decay longer than immediate storage at 45°.

Red raspberries cooled from 70° to 40° or 50° and exposed to 20 per cent. or more of the gas developed less than half the decay shown by fruit held at 41° and less decay than fruit placed at 32°. Gradual cooling

of blackberries in gas storage was nearly as effective as immediate storage at 32°. With dewberries the gas treatments reduced decay to about one-third of that of controls held at a similar temperature.

When tomatoes were inoculated through wounds with *Phoma destructiva* [ibid., xv, p. 781], *Fusarium* sp., and *Colletotrichum phomoides* [ibid., xii, p. 121], and held at temperatures of 50° to 77°, in 25 per cent. or more carbon dioxide, the rate of fungal growth was reduced to about half that in normal air at the same temperature, and was similar to that in normal air 5° to 10° lower. The extreme response of these organisms to temperature [see below, p. 69] coupled with the relatively slight response to carbon dioxide, however, minimizes the value of gas storage in relation to tomato decay. In cultural experiments with *Phomopsis vexans* [ibid., xiv, p. 151], *Sclerotium rolfsii*, *Rhizoctonia* [*Corticium*] *solani*, *Colletotrichum lindemuthianum*, and *Bacillus carotovorus*, the growth of the first was entirely prevented at medium concentrations of the gas, that of the next two organisms was delayed as much by gas treatments as by a 15° to 20° reduction of temperature, but the last two showed little response. Exposure to carbon dioxide markedly inhibited decay in carrots inoculated with *Rhizoctonia* sp. or *Sclerotinia sclerotiorum*, and reduced infection of asparagus sprayed with a spore suspension of *Rhizopus* by 40 per cent. as compared with the controls.

Of the citrus-rotting organisms, *Diplodia natalensis* [ibid., xv, p. 778] was inhibited least by carbon dioxide, followed in order by *P.* [*Diaporthe*] *citri*, *Penicillium digitatum*, and *P. italicum* [ibid., xv, p. 716]. At temperatures approximating to those in storage the ratio of the hours of delay to hours of treatment indicated that the activity of *Diplodia natalensis* was reduced 50 and over 60 per cent. by exposures to 35 to 40, and 50 per cent. of the gas, respectively. The reduction of *Diaporthe citri* and *P. digitatum* was probably rather more. With *P. italicum* exposure to 45 per cent. carbon dioxide gave almost complete inhibition. Exposure to 43 to 45 per cent. carbon dioxide at 77° to 79° had a checking effect approximately equivalent to drops in temperature of 8°, 13°, 23°, and 33° in the case of *Diplodia natalensis*, *Diaporthe citri*, *P. digitatum*, and *P. italicum*, respectively.

Keitt (G. W.), Pinckard (J. A.), Shaw (L.), & Riker (A. J.). **The toxicity of certain chemical agents to Erwinia amylovora.**—*J. agric. Res.*, liii, 4, pp. 307–317, 1936.

A tabulated account is given of tests of the toxicity of a number of chemical compounds and spray materials to the fireblight organism (*Erwinia amylovora*) [*Bacillus amylovorus*: *R.A.M.*, xv, p. 814], by a method based chiefly on the technique of Rideal and Walker, and Anderson and McClintic, as modified by Reddish. Among the materials investigated mercury and silver compounds were by far the most toxic to the organism, suggesting the possibility of eventually adapting mercury for increased use in the control of fireblight. Mercuric cyanide was the least toxic of the mercury compounds, ethyl mercuric chloride was intermediate and mercuric chloride, mercurous chloride, and mercuric oxide were the most toxic. Bordeaux mixture and the zinc sulphate-lime spray were lethal at strengths lower than those usually

recommended for orchard use, though copper sulphate and zinc chloride alone were among the least toxic substances tested. Lime-sulphur showed little or no toxicity to the organism at the concentrations used in practice.

Schmidt (M.). **Venturia inaequalis (Cooke) Aderhold. V. Weitere Untersuchungen über die auf verschiedenen Bäumen lebenden Populationen des Apfelschorfpilzes.** [*Venturia inaequalis* (Cooke) Aderhold. V. Further studies on the Apple scab fungus populations inhabiting different trees.]—*Gartenbauwiss.*, x, 3, pp. 422–427, 1 diag., 1936.

Continuing his studies on physiologic specialization in the agent of apple scab (*Venturia inaequalis*) [*R.A.M.*, xv, p. 30], the writer isolated from five diseased trees a large number (90 to 97 per tree) of monospore cultures. The varieties represented were Beauty of Boskoop (3 trees), Kaiser Wilhelm, and Muscat Pippin, one of the first named being situated at a distance of some 500 m. from the others. Among the 473 isolations 448 morphologically distinct types of the fungus were distinguishable, a result that, taken in conjunction with the frequency of identical forms on different trees, is regarded as conclusive evidence against any correlation between the scab population of a given tree and local features of its habitat; there was, moreover, no necessary connexion between a given population and a particular host. It would appear, from the outcome of these experiments, that the composition of a scab population on any one tree is determined by the interplay of the environmental factors governing the development of infection and the spread of the fungus, in combination with the intense degree of polymorphism manifested by *V. inaequalis* [cf. ibid., xv, p. 513].

Herbst (W.). **Venturia pirina Aderhold. I. Zur Formenmannigfaltigkeit des Pilzes.** [*Venturia pirina* Aderhold. I. On the polymorphism of the fungus.]—*Gartenbauwiss.*, x, 3, pp. 428–450, 13 figs., 1936.

Using similar methods to those employed by Rudloff in his studies on polymorphism in *Venturia inaequalis* [see preceding abstract], the writer cultured on solid agar over 3,000 isolations of *V. pirina* from pear leaves and fruits of different varieties from widely separated parts of Germany and made detailed observations on more than 1,300.

Population analyses of *V. pirina* on 40 standard varieties (including several Butter, Schmalz [Lard], and Dechant types, Bonne Louise d'Avranches, Pastor, Boscs Flaschen, Williams's Bon Chrétien, and Forelle [Trout]) revealed, as in the case of *V. inaequalis*, a pronounced tendency to polymorphism, and a preliminary systematic classification of the various forms represented was made on the basis of cultural coloration (dark brown, mouse-grey, or olive-green) and morphology. Hyphal conformation was found to vary greatly in the different forms, 'smooth' hyphae [with cylindrical cells] being generally produced in the grey and green cultures and 'articulated' ones [with inflated cells] corresponding to the 'S' type in *V. inaequalis* in the dark brown, in which alone conidia were formed to any appreciable extent. Chlamydospores and other deviations from the normal conidial habit were of

frequent occurrence. There were no certain indications of any strict confinement of the various forms or populations to the leaves or fruit. Different forms of the fungus were found to predominate in the various localities furnishing experimental material. In certain districts varieties are attacked which in others are free from infection, and in such cases particular forms could sometimes be isolated which were seldom or never found elsewhere; possibly types of differing aggressiveness and localization were involved. Mutations of various kinds, including albino forms, presumably of nuclear origin, occurred in 16·7 per cent. of the total cultures and are considered to afford a partial explanation of the polymorphism of *V. pirina* in nature. The above-mentioned dark brown cultures, however, are believed to represent the fundamental growth habit of *V. pirina*.

The control of black spot on Pears.—*Tasm. J. Agric.*, vii, 3, pp. 110–113, 2 figs., 1936.

The results of spraying experiments in 1935–6 in a block of Winter Nelis and Beurré Bosc pears affected with black spot [scab; *Venturia pirina*: *R.A.M.*, xv, p. 588] showed that the percentage of clean fruit was raised from 0·5 in the untreated Winter Nelis and 5 in the untreated Beurré Bosc trees to 87·2 and 86 per cent., respectively, in the trees that had received the full spraying programme (six applications). The omission of the calyx spray reduced the percentage of marketable fruit to 45·8 in Winter Nelis and 79·9 in Beurré Bosc. The strong (6–4–40) Bordeaux mixture was slightly more effective than the weak (4–4–40).

Goidànich (G.). **La leptonecrosi degli alberi da frutta ed il comportamento di alcune varietà americane.** [Leptonecrosis of fruit trees and the behaviour of some American varieties.]—*Ital. agric.*, lxxiii, 6, pp. 459–464, 6 figs., 1936.

Italian fruit-growers are urged to abandon the cultivation of the American and Japanese plum varieties derived from *Prunus salicina*, e.g., Burbank, S. Rosa, Shiro, Rutland Plumcot, and Formosa, on account of their great susceptibility to leptonecrosis [*R.A.M.*, xiv, p. 800], and to substitute those belonging to *P. domestica*, on which the disease has never been observed. Leptonecrosis is prevalent in the north and north-central provinces, where apricots and cherries are also affected, though not so severely as plums.

Fish (S.). **Fungus disease control.**—*Fruit World, Melbourne*, xxxvii, 8, p. 5, 1936.

Three years' tests carried out in Victoria showed that peach blossom blight and brown rot (*Sclerotinia fructicola*) [*R.A.M.*, xv, p. 592] were significantly reduced by strict orchard sanitation (including ploughing before the first spraying), spraying with Bordeaux mixture 6–4–40 at the late dormant or early pink bud stage, and applying dry mix lime-sulphur (63 per cent. very finely divided sulphur, 30 per cent. slaked lime, and casein spreader) at the rate of 25 lb. per 100 galls. at the beginning of October, end of November and January, and middle of February. The spray deposit is washed off during the normal processing at the cannery.

Similar experiments with the very susceptible Thiele peach variety showed that rust [*Puccinia pruni-spinosae*: see above, p. 21] was reduced to a minimum by a series of dry mix lime-sulphur cover sprays as used against *S. fructicola* even under conditions strongly favouring infection.

Consistent control of pear black spot [scab; *Venturia pirina*: ibid., xv, p. 728] was given by spraying with Bordeaux mixture 6–4–40 when the young folded leaves protrude from the bud, when they have separated from the closed buds, and again (3–3–50) three weeks after fruit formation. The treatment may cause slight russeting, and should not be used on the Josephine variety.

Berkeley (G. H.). **Root rots of the Raspberry.**—*Canad. J. Res.*, xiv, 8, pp. 306–317, 4 pl., 1936.

Isolations from necrotic lesions on otherwise apparently healthy roots of raspberry plants in Ontario and British Columbia, which in some cases showed marked lack of vigour, yielded *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, xiv, p. 180], *Cylindrocarpon radicicola* [ibid., xv, p. 605], *Fusarium* sp. possibly *F. orthoceras*, *Cylindrocladium* sp., *Pythium* spp., *Rhizoctonia* [*Corticium*] *solani*, and a *Rhizoctonia* of the orchid type [*R. repens*: ibid., xv, p. 449]. While the rotting of the roots may not be entirely responsible for the stunting or death of the above-ground parts, it is believed they play an important role in this connexion and in preliminary inoculation experiments each of these organisms produced necrotic lesions on healthy raspberry roots. The author considers that under certain conditions roots of the raspberry are undoubtedly subject to attack by these fungi. Roots from affected, and, in some cases, from apparently healthy, plants also showed the presence of the Phycomycetous mycorrhizal fungus, already shown to be associated with strawberry and tobacco root rot [loc. cit.]. In a few diseased roots, resting cells of *Asterocystis* were found though little or no necrosis was observed. When strawberry and raspberry seeds were sown in sterilized and non-sterilized soil the roots in the sterilized soil remained healthy, while those in the untreated soil showed necrotic lesions.

The evidence obtained showed not only that certain symptoms of raspberry root rot are similar to those of strawberry root rot [ibid., xv, p. 780] but that many of the organisms associated with strawberry root rot are also present in raspberry root rot.

Dufrénoy [J.]. **Le traitement du sol, désinfection, amendement fumure, en vue de combattre chez les plantes agricoles de grande culture les affections parasitaires et les maladies de carence.** [Soil treatment, disinfection, and an improved fertilizing scheme to combat parasitic infections and deficiency diseases in agricultural economic plants.]—*Annu. agric. Suisse*, xxxvii, 7, pp. 679–728, 6 figs., 4 graphs, 1936.

The writer summarizes and interprets by statistical methods some outstanding contemporary researches on the relations between certain parasitic and deficiency diseases of agricultural plants and various soil defects. Cyto-chemical researches and field experiments statistically

interpreted are shown to constitute a converging technique for the study of soil treatment for the control of plant diseases.

Foëx (E.). **La lutte contre les affections parasitaires des plantes de grande culture par l'adoption de méthodes de culture (assolement et travail du sol) rationnelles.** [The campaign against the parasitic diseases of economic plants by the adoption of rational cultural methods (crop rotation and soil cultivation).]—*Annu. agric. Suisse*, xxxvii, 7, pp. 668–678, 1936.

Improved methods of crop rotation and other cultural practices based on the physical structure, chemical composition and reaction, nutritional properties, or microbiology of the soil, are discussed in relation to the control of a number of well-known plant diseases, including cereal root rots (chiefly *Ophiobolus graminis*) and lucerne sickness [*R.A.M.*, xv, p. 659], clover sickness (including *Sclerotinia trifoliorum*) [ibid., xv, p. 725], and flax sickness (*Fusarium lini*) [ibid., xv, p. 805, and above, p. 41].

Volkart [A.]. **Die Bekämpfung der Pflanzenkrankheiten durch die Züchtung immuner und resistenter Sorten.** [The control of plant diseases by the breeding of immune and resistant varieties.]—*Annu. agric. Suisse*, xxxvii, 7, pp. 745–758, 1936.

The majority of the papers on which this résumé of contemporary studies on plant breeding for immunity from disease is based have been noticed in this *Review* from the original sources.

Eastham (J. W.). **Diseases of cultivated plants.**—*Hort. Circ. B.C.*, 73, 84 pp., 22 figs., 1936.

Brief notes are given on the symptoms and control of the chief fungal, bacterial, and physiological diseases of cultivated plants in British Columbia, together with a short article by B. Hoy on sprays and spraying.

Stakman (E. C.). **The problem of specialization and variation in phytopathogenic fungi.**—*Genetica*, xviii, 3–4, pp. 372–389, 1936.

This lecture, delivered at the International Botanical Congress, Amsterdam, 1935, is a critical discussion, illustrated by references to outstanding contemporary researches [most of which have been summarized in this *Review*], of some important aspects of the specialization, variation, and hybridization of fungi pathogenic to plants.

Feiginson (N.). Выяснение видового состава поражаемых культур, географического распространения и вредоносности вирусных болезней растений. [Determination of the crops susceptible to virus diseases; geographical distribution and injuriousness of virus diseases of plants.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 505–507, 1936.

Careful searches in 1934 in all the cotton-growing areas of the U.S.S.R. showed that Azerbaidjan [Baku] province is the only region where cotton leaf curl [*R.A.M.*, xiv, p. 757] attained any degree of economic importance, the American long fibre varieties being apparently the most susceptible to this trouble. 'Stolbur' [ibid., xv, p. 754]

is stated to be very prevalent on tobacco, tomato, and chilli [*Capsicum annuum*] not only in the Crimea but also in the Moldavian S.S.R., on the Azoff-Black Sea littoral, in Armenia, and in the Stalingrad and Saratoff reaches of the Volga basin, where it causes very considerable annual losses, especially to the fruit-preserving industry. Tomato mosaic occurs wherever the crop is grown, but it causes serious damage only when infection of the transplants takes place very early in the season. Among the virus diseases of the potato rugose mosaic [ibid., xiv, p. 116; xv, p. 459, et passim] is stated to be the most widespread and to cause the largest losses, especially in southern regions. Other crops mentioned as suffering considerable losses from virus diseases are legumes, especially French beans [*Phaseolus vulgaris*], currants, and raspberries.

Melin (E.). **Methoden der experimentellen Untersuchung mykotropher Pflanzen.** [Methods for the experimental investigation of mycotrophic plants.]—*Handb. biol. ArbMeth.*, xi, 4, pp. 1015–1108, 21 figs., 3 diags., 1936.

In this valuable treatise the writer fully describes the methods employed by himself and other workers in experimental studies on mycorrhiza. A seven-page bibliography is appended.

Sempio (C.). **Influenza di varie sostanze sul parassitamento : ruggine del Fagiolo, ruggine e mal bianco del Frumento.** [The influence of various substances on parasitism: Bean rust, Wheat rust and mildew.]—*Riv. Pat. veg.*, xxvi, 7–8, pp. 201–278, 6 figs., 16 graphs, 1936.

A detailed account is given of a comprehensive series of experiments in which seedlings of Giallo cinquantino precoce and Sorpassa Imperatore beans (*Phaseolus vulgaris*) and Gentil rosso and Rieti wheat were grown in a nutrient solution, to which were added known quantities of a large number of organic and inorganic substances, and then inoculated by spraying with a spore suspension of *Uromyces appendiculatus* in the case of the beans, and *Puccinia triticina* and *Erysiphe graminis* in that of the wheat. Parallel controls were similarly inoculated.

With beans, caffeine and theobromine (0·1 and 0·15 per mille, respectively) increased resistance to *U. appendiculatus*, while strychnine and codeine (0·15 to 0·2 per mille) had slightly less effect. Cadmium and nickel in solutions of M/10,000 increased resistance, but appeared to be toxic to the plants. Pyridine markedly reduced infection, but had a very adverse effect on the seedlings.

With wheat, strychnine 0·3 per mille and nickel in solution M/7,500 markedly reduced rust infection, apparently as a result of their direct effect on the fungus, but caffeine, theobromine, and codeine were without effect. On the mildew cadmium in solution M/8,000 to 10,000 had a distinctly adverse effect, apparently due to stimulation of the defensive reactions of the host. Wheat seedlings inoculated with both diseases and grown in nutrient containing cadmium M/7,500 developed only the rust, while others, similarly inoculated, and given strychnine 0·22 per mille, developed only the mildew, infection being abundant in each case.

Amygdalin, arbutin, ethyl alcohol, vaccines prepared from diseased plants, and, to a lesser degree, other substances had a depressive effect

on both the bean [*R.A.M.*, xii, p. 45] and wheat seedlings, which became severely infected by the respective diseases. On the other hand a number of substances, including certain hormones (with beans only), exerted no influence on susceptibility.

Sempio (C.). **Relazione tra il pH dei substrati culturali e l'azione a distanza del piombo.** [The relation between the P_H value of culture media and the action of lead at a distance.]—*Riv. Pat. veg.*, xxvi, 7–8, pp. 279–297, 5 figs., 6 graphs, 1936.

When the conidia of *Thielaviopsis basicola* in hanging drop cultures were exposed to the action of lead at a distance [*R.A.M.*, xiv, p. 647], the reduction in germination was progressively more marked with the following media: (1) apple, tobacco, and cabbage extracts, (2) honey in water, 1 in 9, and carrot extract, (3) beet, turnip, fennel, bean, and potato extracts, (4) spinach and onion extracts, and (5) malt, wort, and meat extracts. Lead also inhibited germination in numerous other nutrients tested. The P_H values of the media in which exposure to lead had the most marked effect (solution A, comprising inorganic compounds plus small amounts of saccharose and asparagin, which gave the best growth, and meat broth) were, respectively, 7·1 and 5·9, the corresponding figures for cabbage and apple extracts, in which exposure had less effect, being 5·04 and 4·02, respectively. When the P_H values of the meat broth and solution A were adjusted to between 4·4 and 4·8 and 4·5 and 5, respectively, by the addition of tartaric acid the depressive effect of the lead on germination appreciably diminished. In the controls, using solution A and meat broth, fungal growth was about the same, whether the media were neutral or acid. Rather more marked results followed when citric and malic acid were used instead of tartaric acid.

Repeat experiments with *Aspergillus niger*, *Penicillium crustaceum*, and *Trichothecium roseum* gave results similar to, but less marked than, those obtained with *Thielaviopsis basicola*. With all four fungi grown in solution A, or malt, apple, or cabbage extracts, the effect of exposure to the lead was most reduced in media with the P_H value lying between 4 and 5·5.

It is concluded that the P_H value of the media markedly increases or reduces the depressive effect on germination of lead exposed at a distance to fungi susceptible to such effect.

Gäumann (E.). **Quelques problèmes d'immunité.** [Some problems of immunity.]—*Annu. agric. Suisse*, xxxvii, 7, pp. 729–744, 1 fig., 6 graphs, 1936.

The writer's discussion of various problems involved in the immunity of plants from certain fungal and bacterial diseases has already been summarized from another source [*R.A.M.*, xv, p. 675].

Gheorghiu (I.). **Étude sur l'immunité chez les plantes.** [A study on immunity in plants.]—*Ann. Inst. Pasteur*, lvii, 2, pp. 204–212, 4 figs., 1936.

By means of injection with a vaccine prepared from autoclaved emulsions, mixed with 2 per cent. formol, of a *Sclerotinia* causing a severe

wilt disease of *Pelargonium zonale*, the writer succeeded in producing temporary immunity (for six to eight months) from infection. A few of the test plants displayed symptoms of intolerance analogous to those observed in animals imbibing an excess of the antigenic principle, but this phenomenon was not of long duration. A microscopic examination of the treated plants revealed the fungus, still in a viable condition, in the leaf tissues, so that the temporary recovery must be due, not to the elimination of the pathogen but either to its loss of toxin-producing capacity or else to the neutralization of the infective principle by the antitoxin secreted by the host as a sequel to vaccination. Antibodies could not be detected in the treated plants, and the actual mechanism of the development of immunity is consequently not fully understood.

KLAPP (E.), MORGENWECK (G.), & SPENNEMAN (F.). **Ueber den Einfluss des Standortes auf Ertrag und Pflanzwert der Kartoffel. Untersuchungen über 21 fünfjährige Nachbaureihen.** [On the influence of the locality on yield and seed value of the Potato. Investigations on 21 five-year progeny series.]—*Landw. Jb.*, lxxxiii, 2, pp. 153–207, 3 graphs, 1936.

In this very comprehensive, fully tabulated account of investigations conducted from 1930 to 1934, inclusive, in 28 localities of Thuringia on the correlation between ecological factors and the yield and health of Parnassia and Erdgold potatoes [*R.A.M.*, xv, p. 247], the writers state that the 21 lots of progeny of the former variety, the original stock of which was relatively free from virus diseases, showed no appreciable falling-off (degeneration) [see next abstracts] during the period covered by the tests, whereas by the fourth year the yields of Erdgold, infected by mosaic and other viruses from the outset, had declined on an average by 30 per cent. In the case of Parnassia the increase of virus diseases was correlated with an extended use of stable manure and synthetic fertilizers in general, as well as with cultivation in low-lying localities, whereas foot rots (comprising various forms of *Rhizoctonia* [*Corticium solani*], blackleg [*Bacillus phytophthorus*], and miscellaneous pathological conditions) were more prevalent in elevated situations and where the supply of phosphates was deficient. Virus infections in Erdgold were most in evidence in sticky, abundantly manured, neutral to alkaline, very prolific soils. In general, the maximum seed value is to be anticipated from crops cultivated in localities intermediate between mountainous regions and those of intensive cultivation, supplied with moderate amounts of nitrogen, and originating from low- to medium-yielding stocks with a low incidence of virus infections and a slight to moderate tendency to other diseases; extremes, in other words, are to be avoided. The conclusion already reached at an earlier stage in these studies, namely, that virus diseases are only one of the factors in the degeneration complex [loc. cit.], is fully substantiated by these supplementary observations.

KLAPP [E.]. **Abbau und Abbaubekämpfung im Pflanzkartoffelbau.** [Degeneration and degeneration control in seed Potato cultivation.] —*Mitt. landw., Berl.*, li, 32, pp. 692–694, 1936.

Following an introductory note on the complex phenomenon of

potato degeneration in Germany [see preceding and next abstracts], the writer sums up the ecological, hereditary, and cultural factors determining the extent and progress of the disturbances grouped under this head, and offers some practical recommendations for arresting the spread of deterioration [cf. *R.A.M.*, xv, pp. 524, 597–599]. These include the selection of isolated sites for seed potato cultivation; drastic and repeated roguing of suspected plants; separate storage of the seed-potato crop; strict attention to cultural practices, avoiding late spring ploughing, premature planting in damp, cold soils, and unduly wide spacing (there should not be less than five plants per sq. m.); the adoption of a rational manuring scheme (sparing nitrogen, liberal phosphate supply); timely harvesting, and great care in the various operations following lifting, and in storage accommodation.

Opitz. **Zur Frage der Virus-Übertragung in Kartoffelfeldern.** [On the question of virus transmission in Potato fields.]—*Dtsch. landw. Pr.*, lxiii, 32, pp. 399–400, 1936.

A series of parallel experiments is in progress at Berlin-Dahlem and Bornim in connexion with a study of virus transmission in relation to potato degeneration [see preceding abstracts], the results of which clearly demonstrate the infectious character of the viruses and the necessity for their rigid exclusion from the field by careful seed selection, drastic roguing during the growing period, and planting in isolated sites, especially in regions where degeneration is prevalent. In one test the 1935 yields of Gisevius and Erdgold seed raised in 1934 in (*a*) healthy and (*b*) diseased surroundings were 221·2 and 197·9 and 78·8 and 125·5 q. per hect., respectively. Some of the varieties officially recognized by the Reich Food Board, e.g., Gold Standard, have been found to be prone to degeneration, while the rejected Feuergold is highly resistant to disorders of this type, as also is the authorized Ackersegen.

Gratia (A.) & Manil (P.). **Virus des plantes et hérédité.** [Plant viruses and heredity.]—*C.R. Soc. Biol., Paris*, cxxii, 22, pp. 814–815, 1936.

The writers were supplied by Prof. Quanjer with tubers and seed of the potato variety Jaune d'Or, a carrier of mosaic [virus X: *R.A.M.*, xiv, p. 327; xv, pp. 680, 738]. The plants raised from both sources presented an identical and entirely normal aspect, but the juice of those originating from the tubers was actively flocculated by the anti-X serum and produced in the *Datura* plants into which it was inoculated the characteristic X virus symptoms. On the other hand, the juice of the plants derived from seed was non-infectious and was not flocculated by the anti-X serum. These results are considered to furnish conclusive evidence against the hereditary theory of virus perpetuation [see next abstract].

Gratia (A.) & Manil (P.). **Perte et récupération de la propriété 'carrier' de virus X chez la Pomme de terre.** [The loss and recovery of the 'carrier' property of virus X in the Potato.]—*C.R. Soc. Biol., Paris*, cxxii, 27, pp. 325–326, 1936.

Jaune d'Or potato seedlings raised from seed and devoid of virus X [see preceding abstract] were inoculated with the virus from

a parallel series of plants derived from tubers and subjected a fortnight later to serological tests, the outcome of which indicated that they were in possession of the infective principle, lost through sexual reproduction.

RALEIGH (W. P.). **An abnormal graft reaction in Potato resulting from a virus infection of a scion on a resistant stock.**—*Phytopathology*, xxvi, 8, p. 795, 1 fig. (on p. 796), 1936.

In the course of studies on the resistance of potatoes to virus diseases [(?) in Maine], Green Mountain scions infected with latent mosaic (X virus) [*R.A.M.*, xiii, p. 465 and preceding abstracts] developed aerial tubers, leaf roll, and marked stunting when grafted on healthy U.S.D.A. seedling 41956, known to be resistant to this disease. Green Mountain seedlings without latent mosaic, grafted on healthy 41956, did not develop the above-mentioned abnormalities, but Green Mountain seedlings infected with latent mosaic reacted like Green Mountain. A similar abnormal reaction was observed on grafts of scions infected by mild mosaic on stocks of the ordinarily fairly resistant Irish Cobbler variety. So far, 41956 has not been systemically infected by latent mosaic to the extent of perpetuating it through the tubers, but it has developed a very slight, sometimes barely perceptible, foliar spotting when grafted on a latent mosaic plant. The general principle of grafting infected scions on potatoes to determine their reaction to a particular virus is believed to offer considerable promise of utility in resistance studies.

BAWDEN (F. C.). **The viruses causing top necrosis (acronecrosis) of the Potato.**—*Ann. appl. Biol.*, xxiii, 3, pp. 487–497, 1936.

The results of investigations discussed in this paper show that top necrosis, although it is rarely seen in the field, can be induced in different potato varieties by the potato viruses A, B, C, D, and X [*R.A.M.*, xiv, p. 523; xv, p. 738]. By inoculating the four varieties Up-to-Date, Epicure, President, and Arran Victory either by grafting or needle inoculation with sap from infected potatoes it has been possible to distinguish the six viruses studied with a fair degree of accuracy, in that top necrosis was induced on Up-to-Date by viruses A, C, and D, on Epicure by B, C, D, and X, on President by B and C, and on Arran Victory only by B; virus Y induced acropetal necrosis on Up-to-Date and President, and foliar necrosis was induced by virus D on President and Arran Victory.

MÜLLER (K. O.). **Die Variabilität der Virulenz und der biologischen Spezialisation bei dem Erreger der Kartoffelkrautfäule, Phytophthora infestans.** [The variability of virulence and biologic specialization in the agent of Potato late blight, *Phytophthora infestans*.]—*Naturwissenschaften*, xxiv, 35, pp. 552–557, 1 map, 1936.

In addition to information already presented in this *Review* from other sources, the writer discusses some further problems arising out of his studies on biologic specialization in *Phytophthora infestans* on potato [*R.A.M.*, xv, p. 600]. It appears from the behaviour of a monosporangial culture of the S type under observation since 1932 (148

generations) that a gradual loss of vitality is the result of transference from the preferred W varieties to some only moderately congenial commercial potatoes; the same monosporangial line on W material maintained its original virulence down to the 146th generation. The loss of vitality was expressed primarily by an impairment of the reproductive faculty and in a secondary degree by protraction of the incubation period and retardation of mycelial growth. A slow recovery of the damaged strains could sometimes be effected by reinoculating them, preferably by means of zoospore suspensions, on to W material. These laboratory results are stated to have been confirmed by field observations on the variations in virulence and vitality of 14 A strains isolated in Silesia and Grenzmark.

It is apparent from these investigations that the host plays by no means only a passive part in its relationship with the late blight pathogen, the fate of which it influences, indeed, in two directions. On the one hand the large-scale cultivation of varieties resistant to a widespread strain of the fungus may involve a complete redistribution of the pathogenic population, while on the other a persistent decline of virulence may accompany the encounter of the parasite with a host to which it is not particularly well adapted.

Stevenson (F. J.), Schultz (E. S.), Clark (C. F.), Raleigh (W. P.), Cash (Lillian C.), & Bonde (R.). **Breeding for resistance to late blight in the Potato.**—*Amer. Potato J.*, xiii, 8, pp. 205–218, 1936.

Under Maine conditions the most promising of the potato varieties resistant to late blight (*Phytophthora infestans*) [see preceding abstract] introduced into the United States, where the ten-year (1925 to 1936) average yield reduction from this cause is estimated at over 9,000,000 bushels, is Foster's Rust Proof or No Blight, but this variety is not widely cultivated. Selections resistant to the disease have been obtained at Presque Isle, Maine, by selfing a susceptible variety (Katahdin), crossing two resistant ones (S45349 and Ekishirazu and No Blight and Ekishirazu), crossing a resistant variety (No Blight) with a susceptible one (Katahdin), the latter probably carrying two heterozygous factors for resistance, and crossing two susceptible varieties (Chippewa and Katahdin). A selection of the last cross was only slightly injured by the late blight epidemic of 1932 in an unsprayed plot, in which the checks were killed, and for four years it has been equally resistant with No Blight and more so than Green Mountain, outyielding the former by 95 bushels of primes per acre (average of three years). Progenies related to the so-called W races of Germany showed a high degree of resistance, while Ackersegen is comparable to No Blight in its reaction.

Volkart (A.). **Die Krautfäuleanfälligkeit der Sorten des Kartoffelrichtsortimentes.** [The susceptibility to late blight of the varieties of the standard Potato assortment.]—*Schweiz. landw. Z. 'Die Grüne'*, *1936*, 35, p. 2, 1936.

Late blight of potatoes (*Phytophthora*) [*infestans*: see preceding abstracts], epidemics of which in Switzerland appear to recur at 20-year intervals, was greatly favoured by the damp summer conditions of 1936. Observations in three localities on the reaction to the disease

of the 21 varieties comprising the standard potato assortment showed that Ackersegen and Voran (both late) are highly resistant, while a satisfactory degree of vigour was further maintained by a number of others, including Alma (medium-early), Centifolia, Jubel, Stärkereiche [Starchy] I, and Wohltmann (all late) [cf. *R.A.M.*, xiv, pp. 390, 606; xv, p. 393, *et passim*].

Findlay (D. H.) & Sykes (E. T.). **Destruction of Potato haulm to prevent blight infection of the tubers.**—*J. Minist. Agric.*, xliii, 5, pp. 457–459, 1936.

In a comparative test carried out on 21st September, 1935, at Terrington St. Clement [Norfolk], on the use of 12½ per cent. (by volume) sulphuric acid (brown oil of vitriol) and 5 per cent. copper sulphate solution at the rate of 100 galls. per acre, for the destruction of green potato haulms against blight [*Phytophthora infestans*: *R.A.M.*, xiv, p. 789; xv, pp. 458, 556], the percentage of infected tubers was reduced from 13·8 in the control to 4·7 and 4, by the two treatments, respectively, the contract costs of which were 17*s.* 6*d.* and 15*s.* per acre. The yield of ware tubers was increased from 9·2 to 11·0 and 11·4 tons per acre, respectively. Copper sulphate was, therefore, as effective as sulphuric acid and besides being somewhat cheaper is more convenient to use. In a further test, a finely divided copper sulphate dust mixed with a spreader and applied from a blower at the rate of 30 lb. per acre destroyed the haulms rather more effectively than the 5 per cent. copper sulphate solution.

O'Brien (D. G.) & Dennis (R. W. G.). **The place of boron in Potato cultivation.**—Reprinted from *Scot. Fmr*, 4 pp., 3 figs., 1936.

Investigations carried out in Scotland on the relation of boron to non-parasitic leaf roll [cf. *R.A.M.*, xv, p. 253], pseudo-net necrosis [ibid., xiv, p. 253; xv, p. 460], and internal rust spot [cf. ibid., xv, p. 249 and below, p. 58] of potatoes indicated that the first-named is characteristic of certain soils and varieties (Gladstone, Catriona, and Di Vernon being susceptible), is most conspicuous in dry seasons, and shows reduced intensity when drought is followed by heavy rain. When borax was applied to two plots (each ⅓ acre in extent) of Gladstone potatoes at the rates of 10 and 20 lb. per acre before planting on 26th April, the shoots emerged much more quickly than in the untreated control plot. On 26th June the treated plots were still noticeably superior to the control, on which leaf roll symptoms were beginning to appear though none occurred throughout the season on the others. When the crop was lifted, the yields per acre amounted to 11 tons 11 cwt. and 10 tons 6 cwt. for the plots given the heavy and light application of borax, respectively, as against 8 tons 11 cwt. in the control, the treatments thus giving increases in yield of 35 and 19 per cent., respectively. It is evident that with susceptible varieties borax applications at rates up to 20 lb. per acre may prove highly beneficial in suppressing the disease and increasing yield. The borax should be mixed with some active material and spread evenly over the field before the drills are drawn. Potatoes are highly susceptible to the toxic effects of excess boron, and the dressing should never be made in the drill.

The experimental evidence obtained demonstrated conclusively that boron deficiency was unrelated to pseudo-net necrosis in Golden Wonder potatoes.

Examination at the end of January of stored Golden Wonder potatoes grown in two plots, one untreated, the other dressed with borax at the rate of 15 lb. per acre, showed 0 and 21 per cent. internal rust spot for the treated and untreated plots, respectively. Further experiments are planned in which it is hoped to secure heavier infection in the controls.

Wheeler (E. J.). **Inoculation of Potato seedlings with the yellow dwarf virus.**—*Amer. Potato J.*, xiii, 8, pp. 220–222, 1936.

Yellow dwarf [*R.A.M.*, xv, p. 249] was found to be transmissible from diseased to healthy potatoes by means of plug-grafting, and it is hoped that this method may prove useful in Michigan in breeding for resistance to the trouble. Several seedlings failed to contract the disease either from exposure to heavy field infection or as a result of artificial inoculation.

Eastham (J. W.). **Potato diseases.**—*Field Crop Circ. B.C.* 15, 34 pp., 25 figs., 1936.

Brief, popular notes are given on the fungal, virus, and physiological diseases of potatoes with special reference to symptoms and control.

Ferdinandsen (C.). **Kartoffelbrok og Kartoffelaal.** [Potato wart and Potato eelworm.]—*Ugeskr. Landm.*, *1936*, pp. 617–621, 2 figs., 1 diag., 1 map, 1936.

The writer summarizes in semi-popular terms the essential information on the life-history and mode of dissemination of potato wart (*Synchytrium endobioticum*), and discusses the distribution of the disease in Denmark [*R.A.M.*, xiv, pp. 741, 788] and the legislative measures [ibid., xiv, p. 544] adopted to stem its advance. So far these have met with only limited success, the number of administrative areas affected at the beginning of 1935 being no less than 117. The export of potatoes from these areas is prohibited, and owners of infected land were supplied by the quarantine authorities with sufficient stocks of the immune Ebstorf Juli Perle and Majestic for use in 1936 and subsequent propagation. Further trials of immune varieties are to be undertaken.

Goss (R. W.). **Fusarium wilts of Potato, their differentiation and the effect of environment upon their occurrence.**—*Amer. Potato J.*, xiii, 7, pp. 171–180, 1936.

Fifteen years' observations in western Nebraska are stated to have shown that, in general, the wilt of Bliss Triumph potatoes caused by *Fusarium oxysporum* [*R.A.M.*, xv, p. 680] is present in small amounts in the majority of fields, whereas that due to *F. solani* var. *eumartii* [ibid., x, p. 13; xiv, p. 334] is less widespread but affects a higher percentage (up to 50) of the plants. The former type, appearing in July and early August, is usually characterized by chlorosis of the basal leaves, followed by rapid wilting of the whole plant or of individual stalks in a hill. The invasion of the stem results from seed-piece decay through soil infection [ibid., v, p. 383]. The latter form of wilt, occurring in

late August and early September, first develops as an interveinal chlorosis and partial necrosis of the youngest leaves. In damp, cool weather the further spread of the disease may be arrested, but a hot, dry spell following infection is liable to cause the premature death of the plants. *F. solani* var. *eumartii* commonly enters through the roots and does not reach the underground stem until the final stages of the disease, when the vascular system shows a deep brown discoloration extending above soil-level and a brown flecking of the pith, particularly at the nodes. The seed piece is also discoloured, the root hairs destroyed, and the root cortex sloughed off. An extensive stem-end rot of new tubers in the field is also frequently caused by *F. solani* var. *eumartii*, another feature of which is a vascular discoloration, with light brown, water-soaked margins, sometimes extending throughout the tuber, which may also show deep black streaks or other variations of the discoloration [ibid., iv, p. 114]. Another form of infection by this fungus occurs through the seed piece and affects the underground stem in the manner described for *F. oxysporum*, from which the wilt may be distinguished in the early stages, however, by the interveinal chlorosis peculiar to *F. solani* var. *eumartii*. In the presence of excessive soil moisture either of these two wilts may induce a reddish or purple upward rolling of the margins and the formation of aerial tubers or shoots in the leaf axils, giving the rosetted aspect associated with stem-girdling by *Rhizoctonia* [*Corticium solani*].

F. oxysporum thrives at high temperatures, the optima for its growth in pure culture and in the soil being 25° to 30° C. and 30°, respectively; in the fields, however, infection may occur at a temperature as low as 14° [ibid., ii, p. 521]. *F. solani* var. *eumartii*, on the other hand, grows better in a relatively cool atmosphere, its optima for development in pure culture and in the soil being 25° and 20° to 25°, respectively, with a maximum at 30°. During the six years from 1930 to 1935, inclusive, the highest percentage (17·9) of *Fusarium* wilt (probably due in the main to *F. solani* var. *eumartii*) at an experimental farm at Alliance occurred in 1932, the coolest season with the heaviest rainfall. In four years' experiments comprising plots planted at 7- to 10-day intervals from the last week in May to the first in July, the average percentages of plants showing field symptoms for the five planting dates were 21·9, 10·4, 5·6, 3·9, and 0·6, respectively, the corresponding figures for tuber infection being 17·3, 16·7, 7·8, 2·5, and 1·6, respectively. The use of infected seed was experimentally shown to result in poor stands, wilted plants, and diseased tubers, and in this connexion the greater susceptibility of Cobbler as compared with Bliss Triumph was again demonstrated.

CUNNINGHAM (H. S.). **Yellow oxide of mercury treatment for seed Potatoes on Long Island.**—*Bull. N.Y. St. agric. Exp. Sta.* 668, 14 pp., 1936.

Treatment of Irish Cobbler and Green Mountain potato seed pieces and whole tubers with yellow oxide of mercury (1 lb. per 15 galls.) [*R.A.M.*, xiv, p. 150; xv, p. 602] against seed-piece decay and *Rhizoctonia* [*Corticium solani*] delayed emergence. The ultimate growth of the Irish Cobbler plants, however, was unaffected, though the Green

Mountain plants tended to be smaller as a result of the treatment. In the only instance when seed-piece decay occurred, Irish Cobblers treated immediately after cutting (4 weeks before planting) showed an ultimate stand of 89 per cent., as against 11 per cent. for the untreated controls.

While the tubers grown on Long Island (where the experiments were conducted) are not ordinarily affected by *C. solani* [ibid., xv, p. 781], stem lesions are common, and in certain soils and seasons infection may delay emergence or adversely affect the stand. Such injury is generally regarded as due to seed-piece infection, though severe damage is often due to soil infection alone. The experimental data obtained showed that the treatment reduced the percentage of stem infections even when the organism was soil-borne, and that the danger of stem infection from the soil may be greater than from diseased seed pieces.

Significant increases in yield were given by the treatment of uncut tubers of the Irish Cobbler variety, but not those of Green Mountain. Treatment of the seed pieces at the time of cutting generally reduced the yields.

Berkner (F.) **Die Wirkung einer physiologisch sauren bzw. alkalischen Düngung auf Ertrag, Schorfbefall und Eisenfleckigkeit von drei genetisch und ökologisch verschieden eingestellten Kartoffelsorten.** [The effect of a physiologically acid or alkaline fertilizer, respectively, on the yield, scab incidence, and 'Eisenfleckigkeit' of three Potato varieties of distinct genetic and ecologic disposition.]—*Z. PflErnähr. Düng.*, A, xlv, 3–4, pp. 205–215, 1936.

A tabulated account is given of the writer's experiments at Breslau to determine the effect of a physiologically acid fertilizer (ammonium sulphate, superphosphate, and potassium sulphate) as compared with a physiologically alkaline one (calcium nitrate, basic slag, and 40 per cent. potash salt) on the incidence of scab [*Actinomyces scabies*: *R.A.M.*, xv, p. 603] and 'Eisenfleckigkeit' [? internal rust spot: see above, p. 55] in three potato varieties, Jubel (scab-resistant, susceptible to 'Eisenfleckigkeit'), Böhms allerfrüheste Gelbe (susceptible to scab), and Zwickauer Frühe (of intermediate reaction to scab). The results were strongly in favour of the acid fertilizer, both from the standpoint of yields (which were increased by 14 per cent.) and from that of scab control.

The data regarding the influence of these fertilizer combinations on 'Eisenfleckigkeit' are not clear-cut, but there is some indication that the symptoms may be alleviated by a supplementary application of lime to acid-treated plots.

Clark (C. F.), Raleigh (W. P.), & Stevenson (F. J.). **Breeding for resistance to common scab in the Potato.**—*Amer. Potato J.*, xiii, 9, pp. 256–259, 1936.

Five out of 34 potato varieties tested during 1935 at Presque Isle, Maine, for their reaction to scab [*Actinomyces scabies*: *R.A.M.*, xv, p. 739] developed less than 1 per cent. as much infection as the susceptible Green Mountain check, while in nine the incidence of the disease was as high as in the control. The highly resistant varieties were Hindenburg, Richter's Jubel, Ackersegen, Arnica, and Hindenburg×

Centifolia No. 9, while relatively low percentages of scab were also shown by Dauerragis, Russet Rural, Hindenburg × Centifolia No. 15, Ekishirazu, and Russet Burbank (1, 1, 1·4, 2, and 3, respectively). Of 90 South American varieties collected in Chile, 58 were found equally prone to scab with Green Mountain, while many of the remaining comparatively resistant sorts produced crops inadequate for infection data.

Tests of seedling progenies were made from 1933 to 1935, inclusive. The material tested in 1933 consisted of a first-year seedling progeny derived from a cross between the susceptible Columbia Russet and Katahdin varieties. All the tubers (white) produced by the 392 seedlings proved susceptible. In 1934 and 1935 trials were conducted with Mahr's Russets × 44537, 44537 × Katahdin, 44537 × 45075, and 44537 inbred. Many of the seedlings of these four progenies were too poorly developed to yield conclusive data, but a number of both russet- and white-skinned segregates gave promising indications for further testing.

Naoumoff (N. A.). Разработка систематики вредоносных фикомицетов, в частности возбудителя порошистой парши Картофеля. [Systematic studies of injurious Phycomycetes, with particular reference to the causal agent of powdery scab of Potato.] –*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 520–523, 1936.

The bulk of this paper is given to a progress report on studies started in 1935 of the biology and pathogenicity of *Spongospora subterranea* [*R.A.M.*, xv, p. 400], a disease of the potato little known in the U.S.S.R. While the infective power of the organism did not appear to be very considerable, infections resulted more freely in all the varieties tested in soils with 60 to 90 per cent. moisture content and with P_H values from 4·7 to 5·9, than in soils with 40 per cent. moisture and higher P_H values. All attempts to induce spores of *S. subterranea* to germinate in the laboratory failed. The potato varieties Pirola, Jubel, Parnassia, Rubia, and Svitez were relatively resistant to powdery scab, Rose of Milet alone appearing to be immune in 1935. The paper terminates with a key based on macroscopic symptoms of all the known diseases of potato tubers.

Roth (H.). **Die Dürrfleckenkrankheit (Alternaria solani) bei Kartoffeln.** [The dry spot disease (*Alternaria solani*) of Potatoes.]—*Dtsch. landw. Pr.*, lxiii, 24, pp. 303–304, 1936.

On the basis of information supplied by A. Aertssen of the Belgian Farmers' Union the author reviews the present position regarding early blight of potatoes (*Alternaria solani*) [*R.A.M.*, xv, p. 394] in Belgium, where it has been very severe during the past two years. Infection generally reaches a climax when the foliage of the early varieties, such as Erstling [Duke of York] and Gelderland Mouse, attains maturity; it is favoured by warm, dry conditions (optimum temperature 26° to 28° C., maximum about 45°) alternating with humid weather. The disease is liable to attack tubers during storage in ill-ventilated cellars or pits at a temperature of 13° to 16°. Control measures should include seed disinfection, summer applications of a standard fungicide, and (where practicable) the eradication during the growing season of all infected plants.

Sharples (A.). **Diseases and pests of the Rubber tree.**—xv + 480 pp., 4 col. pl., 107 figs., 3 graphs, 3 maps, London, Macmillan & Co., 1936. Price 25*s*.

In this comprehensive and finely illustrated volume, the author deals in turn with the structure, reproduction, and physiology of fungi in general, plant form and function, root diseases, infections of the tapping panel, stem diseases, leaf diseases, various minor troubles including scorching, the treatment of rubber diseases, and the adoption of forestry methods of cultivation. A notable feature of the work is the author's treatment of root diseases (133 pp.) which have recently attained such importance in Malaya and to the elucidation of which he has so largely contributed. In an appendix, a list is given of the fungi so far recorded on rubber in Malaya. A practical outlook on the problems dealt with is maintained throughout the work, which will consequently appeal not only to the plant pathologist but also to the rubber planter.

Beeley (F.) **Annual Report. Pathological Division.**—*Rep. Rubb. Res. Inst. Malaya, 1935*, pp. 101–116, 3 pl., 1936.

In areas of young *Hevea* rubber in Malaya the eradication of the root parasites *Fomes lignosus*, *F. noxius*, and *Ganoderma pseudoferreum* [*R.A.M.*, xiii, p. 726; xv, p. 345] is simple and economical, the inspection of all two-year-old trees indicating the diseased patches while still small and enabling the source of infection in jungle timber to be traced and removed. In this way *F. lignosus* should be completely eradicated by the fourth or fifth year and *G. pseudoferreum* and *F. noxius* a few years later. In old rubber the vacant spaces caused by *G. pseudoferreum* are often so large that the best plan is to leave the area alone until all buried roots and timber can be removed and replanting effected with contour terracing. In rubber of medium age the diseased patches should be isolated by trenches, and the infected jungle timber removed if feasible, the saving of the diseased trees by root amputation being practicable provided infection has not passed into the bole. In young rubber the presence of infected areas is indicated on the susceptible natural forest or leguminous bush covers, and this permits eradication to be promptly undertaken. When replanting the soil should be dug over, and all buried rubber roots and undecomposed jungle timber removed. This is very important in peat lands, where *F. lignosus* is prevalent and spreads rapidly along the inter-grafted mesh of lateral roots.

Ustulina zonata [ibid., xv, pp. 471, 632] frequently attacks the collar of rubber trees owing to the accumulation of putrefactive scrap rubber at the soil surface; infection is often confused with root disease, and accounts for more depletion of stand than is generally appreciated.

Wet weather in 1935 caused a considerable increase in white fan blight (*Marasmius*) [? *palmivorus*: ibid., xiii, p. 726]; the fungus is an extremely weak parasite and quickly responds to treatment with a 5 to 10 per cent. solution of tar acid emulsion.

A new bark canker on 5-year-old budded and 6-year-old seedling trees is attributed to physiological disturbance in the bark. It appears on the stem and branches as vertical cracks over a circular patch from

which a little latex may flow. A similar condition is reported from Sumatra.

The appearance of *Corticium salmonicolor* on bush covers, such as *Crotalaria* sp., caused considerable alarm, but can be avoided by giving the rubber sufficient air.

BEELEY (F.). **Oidium heveae. Report on the 1936 outbreak of Hevea leaf mildew.**—*J. Rubb. Res. Inst. Malaya,* vii, 1, pp. 20–26, 1 graph, 1936.

Heavy rains followed by drought caused severe wintering and rapid refoliation of *Hevea* rubber in Malaya in 1936, with the result that in many districts the new foliage was already well developed before weather favouring *Oidium heveae* [*R.A.M.*, xv, p. 115] arrived in mid-March. The central States were again those where mildew activity was greatest, but infection was everywhere less severe than for some years. Under these conditions sulphur dusting gave no marked improvement in foliage or yield. *Helminthosporium heveae* [ibid., xii, p. 425] damaged young rubber trees in some districts.

ZATTLER (F.). **Neuere Untersuchungen über die Nährstoffaufnahme des Hopfens (Ernährungsphysiologie, Wasserhaushalt, Anfälligkeit).** [Recent investigations on food assimilation by Hops (nutritional physiology, water economy, susceptibility).]—Reprinted from *Allg. Brau.-u. HopfZtg, 1936,* 131, 19 pp., 1936.

In the course of his studies in Bavaria on the nutritional requirements of hops, the writer has recorded the effect of various fertilizers on the incidence of downy mildew (*Pseudoperonospora humuli*) [*R.A.M.*, xii, pp. 578, 722; xv, p. 824]. It was found that deficiency in either potassium, phosphorus, or nitrogen increased susceptibility. Excess of potash or phosphoric acid alone induced resistance while excess of nitrogen or lime had the opposite effect. It is thought that an abundance of potash is necessary to prevent excessive transpiration of the plants, which is commonly accompanied by increased susceptibility, and that the use of excess lime induced less resistance by diminishing the essential potash supply.

H.M.L. **The Sugar Cane in Queensland. Report of the Seventh Annual Conference of Sugar Cane Technologists.**—*Int. Sug. J.*, xxxviii, 451, pp. 248–250, 1936.

In a paper read before the Queensland sugar-cane technologists in April 1936, H. F. Bell stated that dwarf disease [*R.A.M.*, xi, p. 472; xv, p. 320] appears to be distinct from any known disease and its origin at Rosella in 1930 remains a complete mystery. It is probably due to a virus since cuttings from diseased stools gave rise to affected plants, irrespective of the soil type. On farms somewhat remote from the apparently original centre of infection spread seems to have been checked by the uprooting of the diseased stools, but this is not the case in the low-lying fields in the wetter areas of Rosella. The varieties chiefly affected are P.O.J. 2714 and Malagasche, particularly the former, but Clark's Seedling has also shown the disease, though M.1900 Seedling and Q.813 appear to be entirely unaffected. The only precautionary

method so far available is not to plant a susceptible cane where there is any likelihood of infection.

Brandes (E. W.) & Sartoris (G. B.). **Sugar-Cane: its origin and improvement.**—*Yearb. Agric. U.S. Dep. Agric.*, pp. 561–624, 14 figs., 1936.

In this exhaustive account of the development of modern sugar-cane varieties the authors state that in Louisiana the breeding value of parent varieties is estimated by the progeny test, which consists in determining the number and proportion of the various kinds of seedlings produced by an individual or cross. Two varieties that possess the essential characters between them are crossed, and if the resulting individuals approach the desired types, they and subsequent progenies are sent to the district for which the new variety is intended. During the first year every individual of the progeny is inoculated with mosaic, and the susceptible varieties are eliminated. Early in the autumn the sucrose content of all the individuals that approach commercial types is determined, those with a satisfactory sugar content and early maturity being segregated. The seedlings are then inoculated with different strains of *Colletotrichum falcatum* [*R.A.M.*, xv, p. 826], and those sufficiently resistant for commercial requirements are planted in increase plots on different soils. The next year the seedlings are subjected to the same treatment, and observations are made in the original planting to determine the stubbling qualities of the selected individuals. The varieties that continue to show promise are then sent to various localities to be increased, or planted in replicated variety tests. Before a new variety is released determinations are made of its yielding capacity per unit area, disease resistance, and the soil type to which it is best adapted.

All varieties of *Saccharum spontaneum* except Koelawi A are immune from mosaic, while all varieties of *S. officinarum* and all the forms cultivated in India are susceptible to infection. The hybrids of *S. officinarum* and the forms of *S. spontaneum* with 112 and 80 somatic chromosomes are immune, while the hybrids of noble varieties and the Indian forms of *S. spontaneum* are susceptible. *S. robustum* is susceptible.

Petrak (F.) & Sydow (H.). **Ein kleiner Beitrag zur Kenntnis der Pilzflora Japans.** [A small contribution to the knowledge of the fungus flora of Japan.]—*Ann. mycol., Berl.*, xxxiv, 3, pp. 237–251, 1936.

An annotated list is given of 29 Japanese fungi, of which nine are regarded as new to science and furnished with Latin and German diagnoses. *Haplosporella mali* [*Physalospora obtusa*: *R.A.M.*, xv, p. 31] was found on pear cortex and *Botryodiplodia malorum* [*P. mutila*: ibid., xv, pp. 31, 726] on pear and apple branches.

Kochman (J.). **Grzyby głowniowe polski.** [The smut fungi of Poland.]—*Planta polon.*, iv, pp. 1–161, 12 pl., 1 fig., 1936.

This is an account of the smuts which have been recorded to date in Poland. Some 130 old species are shortly described in Polish, and two new species of *Entyloma* on *Ranunculus* are proposed with Latin

diagnoses. Among the less commonly reported species may be noted *Tuburcinia* [*Urocystis*] *gladioli* on *Gladiolus imbricatus*, *T. primulae* on *Primula officinalis*, *Entyloma calendulae* on *Calendula officinalis* [*R.A.M.*, xv, p. 23], *E. cichorii* on chicory [ibid., xiv, p. 398], *E. dahliae* on dahlia [ibid., xv, p. 23], *E. winteri* on delphinium, and *E. fuscum* on opium poppy [loc. cit.].

Hiratsuka (N.). **A monograph of the Pucciniastreae.**—Reprinted from *Mem. Tottori agric. Coll.*, iv, 374 pp., 11 pl., 1936.

The writer presents a world monograph of the Pucciniastreae, one of the five sub-families of the Melampsoraceae; he admits eight genera: *Pucciniastrum* (with 32 species), *Calyptospora* (1), *Melampsorella* (2), *Thekopsora* (15), *Uredinopsis* (17), *Melampsoridium* (4), *Hyalopsora* (9), *Milesina* (51). So far as is known, all the species whose life-histories have been elucidated are heteroecious, and their aecidial stages occur on needles or cone scales of *Abies*, *Picea*, *Tsuga*, or *Larix*. The general part includes an account of the general characters of the spermogonial, aecidial, uredospore, and teleutospore stages, the classification, the host plants, the phylogeny, and the world and local Japanese distribution of the species of this sub-family. The writer follows the almost universal interpretation of the International Rules of Nomenclature in not accepting as valid a generic name first applied to a uredo form. He accordingly maintains the name *Milesina* Magnus (1909) against *Milesia* White (1877), and has transferred some dozen outstanding species from the latter to the former genus.

In the special part, each genus is given a diagnosis, the type species is stated and the species keyed out on morphological characters. Each species is given a full description with a statement of the host plants, distribution, and published exsiccata. The volume, illustrated with some 60 microphotographs, closes with a bibliography of 523 titles, a fungus index of valid names and synonyms, and a host index.

Buchwald (N. F.). **Plantepatologiske Meddelelser 1–5.** [Phytopathological notes 1–5.]—*K. VetHøjsk. Aarsskr., 1936*, pp. 132–140, 2 figs., 1936. [English summary.]

Blossom wilt and die-back of young apple shoots has been found to be caused in Denmark by *Sclerotinia laxa* f. *mali* [*R.A.M.*, xv, p. 159].

All the specimens of *Pestalotia* [*Pestalozzia*] on *Rhododendron* leaves examined were found to belong to *P. macrotricha* [ibid., xiv, p. 608], the hosts of which include *Azalea indica* [*R. indicum*], *R. argyrophyllum*, and *R. sutchuenense*.

Beech seedling cotyledons have several times been found to be infected by *Gloeosporium fuckelii*.

Sphaerotheca [*humuli* var.] *fuliginea* [ibid., xii, pp. 396, 650] was observed on the cultivated *Veronica andersonii* and *V. myrtifolia*, apparently new hosts for this organism.

Danish-grown parsley seed was found in the winter of 1934–5 to show up to 20 per cent. infection by *Septoria petroselini* [ibid., xiii, p. 559], a common parasite of the leaves not known to have been previously reported on the seed.

Hill (A. V.) & Allan (J. M.). **Downy mildew (blue mould) of Tobacco. Attempts at control by the use of (I) sprays, and (II) heated seed-beds.**—*J. Coun. sci. industr. Res. Aust.*, ix, 3, pp. 220–232, 2 figs., 1936.

In comparative spraying tests against tobacco downy mildew (*Peronospora tabacina*) [*R.A.M.*, xv, p. 756] carried out in New South Wales and Victoria in 1934–5 it was found that in general copper emulsion protected the seedlings for a longer period than colloidal copper or Bordeaux mixture (4–4–40, or 2–2–40 when necessary). Subsequent spread was rapid in the unsprayed plots, and in many cases no seedlings suitable for transplanting were obtained. When infection occurred early few or no healthy seedlings were obtained from the plots sprayed with Bordeaux mixture but most seedlings from the other treated plots were healthy, copper emulsion giving slightly better control of rate of spread than colloidal copper. Repeated applications of Bordeaux mixture caused much stunting. The data obtained indicate that seedlings grown in areas comparatively free from infection are likely to remain healthy until reaching transplanting size if sprayed with copper emulsion or colloidal copper.

Tests with heated seed-beds indicated that it is impossible to prevent infection and at the same time obtain satisfactory seedlings by temperature regulation, while the degree of control of humidity obtained in the experiments was also insufficient to prevent occurrence and spread.

Dixon (L. F.), McLean (Ruth A.), & Wolf (F. A.). **Relationship of climatological conditions to the Tobacco downy mildew.**—*Phytopathology*, xxvi, 8, pp. 735–759, 5 graphs, 1936.

The conclusions previously reported by the writers as to the dependence of tobacco downy mildew [*Peronospora tabacina*: see preceding and next abstracts] on weather conditions [*R.A.M.*, xiii, p. 603] have been further substantiated by observations in North Carolina and climatological data in 1933 to 1935.

Primary outbreaks of the disease do not necessarily occur on corresponding dates in successive years, but coincide with, or immediately follow, warm spells (1) when the minimum temperature of the surface layer of soil has been maintained at or above 50° F. for several days, and (2) when the seedlings are sufficiently large for the lower leaves to come into contact with the soil. Secondary infection may take place about a fortnight later during any kind of weather normally prevalent from March to May since dew is formed on the leaves each night. Sporulation is promoted by protracted periods of saturation with an overcast sky, and is abundant at a temperature range from 42° to 63° (optimum 56°); above 68° and below 36° few or no sporangia are formed, while maximum temperatures above 90°, accompanied by intense sunshine, inhibit profuse sporulation even when nocturnal conditions favour the process. Sporangial dissemination reaches a climax when windy conditions accompany or immediately follow periods of abundant sporulation. The general outbreak of downy mildew in any locality occurs about three weeks after the primary attack. The primary period of dissemination lasts about a fortnight and the secondary a week.

Recovery from downy mildew appears to be initiated by factors inherent in the tobacco seedlings rather than by any particular set of weather conditions, though the process is accelerated by warm, clear days and warm nights.

Wolf (F. A.), McLean (Ruth A.), & Dixon (L. F.). **Further studies on downy mildew of Tobacco.**—*Phytopathology*, xxvi, 8, pp. 760–777, 6 figs., 2 graphs, 1936.

The writers' previous conclusions as to the importance of the oospores of *Peronospora tabacina* [see preceding abstract] as a source of inoculum for the strictly localized primary outbreaks of tobacco downy mildew in seed-beds in North and South Carolina [*R.A.M.*, xiv, p. 723] have been substantiated by further observations, which showed that sporangia were not present in the air until a considerable period after the primary outbreaks had taken place, and that a very small proportion of the oospores (less than 12 out of several thousand tested) are able to germinate. Further evidence was also obtained that seed-beds on old sites are liable to act as foci of initial infection.

The morphological features of *P. hyoscyami*, *P. nicotianae*, and *P. tabacina* [ibid., xiv, p. 657] are compared and discussed, and on the basis of these studies Adam is followed in referring the agent of downy mildew to *P. tabacina* [ibid., xiii, p. 132], though it is admitted that the morphological differences between *P. hyoscyami* and *P. tabacina* are not very great and that some might prefer to regard the latter as a variety of the former. The sporangia of *P. tabacina* measure 10·5 to 24 (mean 18·4) by 10·5 to 22 (15) μ, the oogonia 40 to 74 μ in diameter (53 μ), and the oospores 24 to 43 μ (32 μ).

Apart from the avoidance of previously used sites for seed-beds, the most important means of combating downy mildew consist in the provision of increased facilities for the access of direct sunlight to the seedlings and several applications to the beds of nitrate of soda.

Chester (K. S.). **Serological tests with Stanley's crystalline Tobacco-mosaic protein.**—*Phytopathology*, xxvi, 8, pp. 715–734, 7 graphs, 1936.

The Schultz-Dale modification (*Rep. med. Res. Coun., Lond.*, ix, p. 229, 1931) of the anaphylaxis test (based on the thesis that an animal injected with a small amount of protein develops, after about three weeks, a high degree of sensitivity towards that particular protein) was applied to materials containing a number of plant viruses. None of the viruses tested, viz., tobacco mosaic and ring spot [*R.A.M.*, xv, p. 751], peach yellows, rosette, and little peach [ibid., xv, pp. 516, 691], and the rugose, mild, and latent potato mosaics [ibid., xv, pp. 459, 614, and next abstract], gave anaphylactic reactions, as was shown in tests made both by absorbing the uterine muscles of a guinea-pig with healthy plant juices prior to testing for virus reaction (thereby eliminating the reactions due to healthy plant proteins), and by using as virus hosts for sensitization and testing, respectively, two plant species (tobacco and *Phlox*) so distantly related that the only common serological element was the virus [cf. ibid., xv, p. 671]. Healthy plant proteins, on the other hand, were highly anaphylactogenic. The proteins

of healthy tobacco and healthy tomato were found to be serologically very similar.

The uteri of guinea-pigs sensitized with healthy plant proteins reacted to solutions of Stanley's crystalline tobacco mosaic virus protein [ibid., xv, p. 754] and vice versa. Complement-fixation tests confirmed the results of the anaphylactic experiments by showing cross-reactivity between the crystalline and the healthy plant protein, a phenomenon apparently due to the presence in the former of a contaminating protein serologically allied to, or identical with, that of the healthy tobacco plant.

Considerable amounts of virus were detected in the crystalline materials as a result of precipitin and complement-fixation tests.

Precipitin tests of the sera from sensitized guinea-pigs indicated that in a given animal the tobacco mosaic virus may be a very active precipitinogen but anaphylactically passive, whereas healthy tobacco proteins in the same animal may be relatively inert in precipitin production but highly active in the stimulation of anaphylaxis. These data are held to imply that the mechanisms of the two reactions are quite different, although the same antibodies may be concerned in both.

Chester (K. S.). **Separation and analysis of virus strains by means of precipitin tests.**—*Phytopathology*, xxvi, 8, pp. 778–785, 1936.

A tabulated account is given of experiments in the differentiation of ten strains of tobacco mosaic and three of latent potato mosaic [see preceding abstract] by means of Helen P. Beale's absorption technique [*R.A.M.*, xiv, p. 197]. It was thus ascertained that ordinary tobacco mosaic (tobacco virus 1) and Holmes's masked tobacco mosaic [ibid., xv, p. 533] are closely related serologically while tomato aucuba mosaic [tobacco virus 6] [ibid., xv, p. 611] differs significantly from both but is allied to four out of seven of Jensen's yellow mosaic strains [ibid., xv, p. 533]. Serological distinctions were further established between the three latent potato mosaic strains—mottle, ring spot [ibid., xv, p. 459] masked mottle—and a strain of latent potato mosaic isolated by the writer from apparently healthy potatoes, which caused systemic infection without external symptoms in tobacco and *Datura tatula* and severe systemic necrosis in pepper [*Capsicum annuum*]. Not only did the precipitin technique used in these studies serve to differentiate the several virus strains, but it also gave some clues to their antigenic constitution.

Sheffield (F[rances] M. L.). **The susceptibility of the plant cell to virus disease.**—*Ann. appl. Biol.*, xxiii, 3, pp. 497–505, 1 graph, 1936.

A tabulated account is given of experimental work with tobacco, tomato, *Nicotiana glutinosa*, and *Solanum nodiflorum* plants, the results of which conclusively showed that the viruses of tobacco mosaic (Johnson's No. 1) and tomato aucuba mosaic [tobacco virus 6] cannot enter the plant unless some of the surface cells are injured. It was further shown on *N. glutinosa* with tomato aucuba mosaic that for infection to result it is not essential that the cells should be injured in the actual presence of the virus; the percentage of infection after

wounding, however, rapidly declined from 78·9 when the inoculum was applied after one minute, to 42·9 after four, 25·6 after ten, and down to 2·8 after 30 minutes. Inoculations of tobacco mosaic, tomato aucuba mosaic, and Hy. III [*R.A.M.*, xiv, p. 51] viruses with a micropipette into single cells of tobacco plants yielded only about one-tenth of the expected number of positive infections, suggesting the existence of differences in the susceptibility of the cells to virus attack.

Sheffield (F[rances] M. L.). **The role of plasmodesms in the translocation of virus.**—*Ann. appl. Biol.*, xxiii, 3, pp. 506–508, 1 pl., 1936.

An indirect support for the view that plant viruses travel from cell to cell along the protoplasmic bridges (plasmodesms) [*R.A.M.*, xiv, p. 51] is inferred by the author from her studies of epidermal strippings of virus-infected leaves of tomato, tobacco, *Hyoscyamus niger*, and *Solanum nodiflorum* (treated by Craft's technique for demonstrating plasmodesms), the results of which showed that guard cells, which have never been seen to contain the intracellular inclusions characteristic of many viruses in their appropriate hosts [loc. cit.], have no protoplasmic connexion with the surrounding cells. Likewise there appears to be no plasmodesms between the embryo and parent tissues, which may be a possible explanation of the non-transference of virus infection through seed.

Beaumont (A. B.). **A hypothesis to explain brown root rot of Havana seed Tobacco.**—*Science*, N.S., lxxxiv, 2173, pp. 182–183, 1936.

Preliminary researches are recorded on the nature and cause of tobacco brown root rot [*R.A.M.*, xii, pp. 477, 493] in Connecticut. Water culture experiments showed that ammonium compounds, amino acids, and certain amides were toxic to tobacco and caused symptoms very similar to those of brown root rot. Tobacco was found to be very sensitive to the toxic effects of unoxidized forms of nitrogen, whereas the nitrate was readily assimilated when tobacco was grown to maturity. The tops of affected field-grown plants contained more total nitrogen than normal field plants, but there was little difference as between the roots. Dressings with peat or monocalcium phosphate, both of which absorb or inactivate ammonia, in some cases reduced or eliminated the condition, while sodium and calcium nitrates did not, and lime reduced it only in the latter part of the season when it is thought to enhance nitrification. The disease was at its worst early in the season and in cool, wet seasons (when conditions were unfavourable to nitrification), and decreased late in July, when nitrification was at its peak. It was not transferred from one soil to another by inoculation, but was reduced or eliminated by air-drying of infected soil. It was severe following certain crops, particularly maize and timothy [*Phleum pratense*], but seldom occurred when tobacco was continuously grown, and badly affected fields usually recovered after one or two years of tobacco culture.

It is suggested that the disease is indirectly caused by the unoxidized forms of nitrogen that result from the decomposition of organic matter. The root-rotting is due to high nitrogen concentration in the

roots or a narrowed carbon-nitrogen ratio brought about by the rapid absorption of basic nitrogen, which makes the roots very susceptible to decay organisms present in the soil.

Garner (W. W.), Allard (H. A.), & Clayton (E. E.). **Superior germ plasm in Tobacco.**—*Yearb. Agric. U.S. Dep. Agric.*, pp. 785–830, 12 figs., 1936.

In this comprehensive, semi-popular account of tobacco-breeding, progress is surveyed in the work of breeding against diseases, increasingly heavy losses from which in recent years render the problem of major importance in the United States.

Mandelson (L. F.). **The Tobacco-growing industry in the United States of America. Tobacco diseases.**—*Qd agric. J.*, xlvi, 2, pp. 143–169, 25 figs., 1936.

A popular account is given of the principal diseases and pests of tobacco in the United States, and their control.

Johnson (J.). **Relation of root pressure to plant disease.**—*Science*, N.S., lxxxiv, 2171, pp. 135–136, 1936.

By means of the direct application of high-water pressure to the root system, water-soaking is readily induced in tomatoes, which thereby acquire an unwonted susceptibility to *Bacterium angulatum*. Tobacco plants similarly treated readily contract infection both by *Bact. angulatum* and *Bact. tabacum* [cf. *R.A.M.*, xvi, p. 2], developing large, necrotic lesions resembling those commonly observed in the field. Similar, though less striking, results were obtained by the increase of root pressure through the simultaneous exposure of plants to a high soil and low air temperature. High root pressures in the field are known to result from a particular sequence of weather conditions which is liable to precede epidemics of tobacco disease.

Barradas (H.). **Contribuição ao estudo das pragas do Tobaco.** [A contribution to the study of Tobacco pests.]—*Bol. Minist. Agric. Rio de J.*, xxv, 4–6, pp. 123–136, 15 figs., 1 graph, 1936.

In connexion with an account of the ravages of crickets (*Neocurtilla hexadactyla* or *Gryllotalpa vulgaris*) in the Brazilian tobacco plantations, some recommendations are made for the biological control of this formidable pest by the application to the soil of cultures of entomogenous fungi, e.g., *Beauveria bassiana* [*R.A.M.*, xv, p. 217], at the rate of 250 c.c. in 250 l. water. An Eclair (Vermorel) apparatus, preferably made of zinc, should be used with 30 to 100 lb. pressure, and the spraying should be carried out at the close of the rainy season.

Best (R. J.) & Samuel (G.). **The reaction of the viruses of Tomato spotted wilt and Tobacco mosaic to the P_H value of media containing them.**—*Ann. appl. Biol.*, xxiii, 3, pp. 509–537, 6 graphs, 1936.

Further studies on the effect of the P_H value of the suspension media on the activity of the tomato spotted wilt virus [*R.A.M.*, xv, pp. 41, 404] are reported, together with the results of investigations on tobacco mosaic (Johnson's No. 1) virus. In all experiments the concentration of juice

was chosen to fall on the straight line portion of the dilution curve within which the primary lesion method gives a reasonably accurate estimate of relative concentrations of the virus [ibid., xiv, p. 781]. In regard to the virus of tomato spotted wilt, activity-time curves at constant P_H value showed that in the absence of oxygen and at 0° C. suspensions of the virus buffered at P_H 7 in general remain at constant activity for six hours or more. It was also found that under the same conditions the virus is inactivated at and below P_H 5 and above about 10, the activity remaining practically constant within the P_H range 6 to 8·9 for a half-hour or 5-hour contact. For the ordinary tobacco mosaic the activity-time curves at constant P_H value showed that when buffered at P_H 7 this virus did not change in activity for at least 24 hours at room temperature (about 20°). At about P_H 9 the activity begins by rapidly decreasing, but eventually a point is reached at which it remains constant. By adjusting the P_H value of the suspensions from 9 to 7 soon after preparation, a marked reactivation is brought about, but the amount of reactivation gradually grows smaller the longer the adjustment is delayed. Suspensions at P_H 2 cause significantly fewer lesions than the corresponding control inocula, whereas the activity of suspensions held at P_H 2 for various lengths of time and adjusted at P_H 7 before inoculation is practically the same as that of the controls at P_H 7; this difference is in part attributed to an effect on the host. The activity-P_H curves which were constructed for tobacco mosaic virus showed that the virus was inactivated above P_H 8·2 and below P_H 2, the inactivation being complete at P_H 11 and 0·5.

The results of these investigations are considered to indicate the necessity of eliminating the effect of P_H value on activity in future work with viruses. The very different nature of the P_H-activity curves for the two viruses studied suggests the possibility of using this relationship as a means of differentiating between viruses; among other applications, it is stated that the tomato spotted wilt virus may easily be removed from a mixture with tobacco mosaic by adequately adjusting the P_H value. With a virus such as that of tomato spotted wilt, the negative results obtained from reinoculation tests of expressed juice may be due to an inactivation of the virus by an acid juice, unless the P_H value of the expressed juice is within the range for activity. It is further pointed out that the activity-P_H curves of the two viruses resemble similar curves for enzymes more closely than curves for living organisms, while another argument in favour of the non-organismal nature of the virus of tobacco mosaic is adduced from its attainment of what appears to be a steady state at P_H 9.

Nightingale (Alice A.) & Ramsey (G. B.). **Temperature studies of some Tomato pathogens.**—*Tech. Bull. U.S. Dep. Agric.* 520, 36 pp., 9 graphs, 1936.

In experiments on the effects of maturity and temperature on the development of nine important fungi responsible for storage rots in tomatoes in the United States *Fusarium semitectum* [*R.A.M.*, xv, p. 775], *Phoma destructiva* [see above, p. 44], *Alternaria solani* [ibid., pp. 406, 690], and *Pleospora lycopersici* [ibid., xiv, p. 799] grew much

better on potato dextrose agar at P_H 6·01 (corresponding to ripe tomato juice) than at P_H 4·7 (green tomatoes), this result indicating that change in acidity is an important factor in inducing increased virulence of these organisms to ripe fruit.

Rhizoctonia [*Corticium*] *solani* [ibid., xv, p. 690] and *Melanconium* sp. [ibid., ii, p. 245] (*Phytopathology*, vi, p. 390, 1916) grew somewhat better at P_H 6·01 than at P_H 4·7 at temperatures most favourable to growth (65° to 85° F.). Both fungi develop on green, and rather better on ripe, fruits. The cardinal temperatures for *C. solani* were 45° to 49° F., 80°, and 90° to 95° and for *Melanconium* sp. 45° (on agar), 80°, and 90° to 95°. The latter withstood a week at 33° to 38°, and in inoculated fruits incubated (after one day at room temperature) at 35° to 41° caused slight lesions after 10 or 11 days. *C. solani* remained alive in inoculated tomatoes after 2 weeks at 32° to 41°, but all inoculations at temperatures below 50° were unsuccessful.

F. semitectum grew best at 75°; the maximum temperature for growth on agar was 92° to 95° and the minimum on agar 41° to 43° and on the fruit 45°; cultures on agar at 30° to 34° were alive after 3 days.

Colletotrichum phomoides [ibid., xiv, p. 121] grew faster on ripe than on green fruits. In culture, there was not much difference in growth rate at the two acidities. The optimum temperature for growth was 80°, the maximum 95°, and the minimum on agar was 35° and for lesion development 45°.

Cultures of *Phoma destructiva* withstood 32° for 20 days. The minimum temperature for growth on agar was 40° and for fruit decay 45°, and the maximum on agar was 85°, at which temperature inoculations gave doubtful results.

Cladosporium fulvum [ibid., xv, p. 690] showed no consistently different reaction at the two acidities, but growth was usually more rapid on the less acid medium at temperatures over 60°. The optimum temperature for growth on agar was 70°, the maximum 85°, and the minimum 32° to 35°. Some of the spores resisted a temperature of 93°.

The optimum of *A. solani* was 80°, its maximum 95°, and its minimum 35°; it remained alive at 30° to 32°, but no tomato decay occurred under 45°.

The growth of *A. tomato* was only very slightly favoured by the less acid agar, and was very rapid at P_H 4·7. The optimum temperature for growth was 85°, the maximum 95°, and the minimum 35°; slight decay was noted in green fruits on the eighth day at 32° to 41°.

Pleospora lycopersici showed a maximum temperature for growth of 87°, (but lived for a week at 93° to 97°), a minimum of 32° to 34°, and an optimum for lesion development on ripe fruits of 70°, and on green fruits of 65°.

Carter (J. C.). **Thyrostoma compactum on Ulmus pumila.**—*Phytopathology*, xxvi, 8, pp. 801–804, 1 fig., 1936.

Thyrostoma compactum (Sacc.) v. Höhn. was found to be associated—obviously in a causal capacity, though isolation and germination experiments were a failure—with elm (*Ulmus pumila*) cankers in Illinois. The lesions mostly occurred at or near soil-level but were

occasionally observed near the top of the main stem of trees 25 ft. high; the outer host tissues shrivelled, collapsed, and adhered tightly to the stem, producing a girdling effect. Three to four weeks after the appearance of the canker, the dark brown to black, circular, convex, compact tubercles, 600 to 900 μ in diameter, 350 to 500 μ in height, force their way to the surface of the stem. The deep tan to brown, oblong, somewhat clavate, bi- to multicellular, partly muriform conidia, 39 to 54 by 13·3 to 16·6 μ (average 46·5 to 14·5 μ) are produced singly on short, tan, rod-like conidiophores over the outer face of the tubercle and accumulate as a compact mass at the top. Excision appears to be a satisfactory means of control.

CARTER (J. C.). **Cytosporina ludibunda on American Elm.**—*Phytopathology*, xxvi, 8, pp. 805–806, 1936.

Cytosporina ludibunda, which was prevalent on American elms [*Ulmus americana*] in Illinois in 1934 [*R.A.M.*, xiv, p. 537] and to a lesser extent in 1935, was isolated in pure culture and inoculated into five potted trees, through wounds in three cases. All the trees developed signs of successful infection after an incubation period of 25 to 54 days, the first tree wilting completely in 54 days, but the re-isolation of the fungus was effected only in the case of the wounded individuals, the xylem of which showed a light brown discoloration.

GOIDÀNICH (G.). **Sulle cause della cosidetta 'defogliazione primaverile' del Pioppo in alta Italia.** [On the causes of the so-called 'spring defoliation' of the Poplar in upper Italy.]—*R.C. Accad. Lincei*, xxiv, 1–2, pp. 27–30, 1936.

An account is given of the writer's studies in Emilia, Lombardy, and Piedmont on the so-called 'spring defoliation' of poplars (*Populus canadensis*), which is stated to be particularly severe in the vicinity of Turin. The disease appears to be very similar to, if not identical with, that described by Vuillemin from France (*C.R. Acad. Sci., Paris*, cviii, p. 632, 1889) as due to a *Phoma* representing the pycnidial stage of *Didymosphaeria populina*, but subsequently attributed by Prillieux (loc. cit., p. 1133, 1889) to *Napicladium tremulae* (*Fusicladium radiosum*) [*Venturia tremulae*: see above, p. 5] the latter opinion being still generally held in Italy to-day. The writer, on the contrary, upholds Vuillemin's diagnosis of the condition as resulting from infection by a Sphaeropsid (termed G. 2191), the exact systematic position of which, however, is uncertain.

There are various important differences between the Sphaeropsid and *F. radiosum*, for which the author (in a forthcoming paper in *Ann. Bot., Roma*) has substituted the name of *Stigmina radiosa* (Lib.) G. Goid. The latter, in the first place, is almost exclusively a foliar parasite, whereas attacks by the Sphaeropsid originate in the branches, generally at the points of insertion of the buds, whence the fungus rapidly spreads both upwards and downwards. The portion of the shoot above the site of infection assumes a characteristic hook shape and shrivels, and the leaves fall. In pure culture, colonies of the Sphaeropsid attain a diameter of 5 to 6 cm. in ten days, during which period the growth of *S. radiosa* does not exceed 4 to 5 mm. The former gives rise to abundant

pycnidia while the latter produces conidia typical of the genus. (In a foot-note the author reports the development in cultures of *S. radiosa* of bodies suggestive of rudimentary perithecia, necessitating a future consideration of its relationship with *D. populina* or some other Ascomycete.) Both fungi may co-exist in the same locality and even on the same tree, and the symptoms induced by the virulent Sphaeropsid may be aggravated by the invasion of the relatively innocuous leaf parasite.

Rohde (T.). **Beitrag zur Kenntnis einer krebsartigen Eichenkrankheit und ihrer Pilzflora.** [A contribution to the knowledge of a canker-like Oak disease and its fungal flora.]—*Mitt. Forstwirt. Forstwiss.*, vii, 1, pp. 63–116, 50 figs., 3 diags., 8 graphs, 1936.

An exhaustive account is given of the writer's laboratory and field studies on an oak canker affecting 20- to 25-year old trees in the Harz mountains and elsewhere in northern Germany. The vessels of the discoloured (pale yellowish- to dark reddish-brown) wood underlying the elliptical cankers on the stem were found to be occluded by tyloses and permeated by fungal hyphae, while the medullary rays were filled with wound gum. The fungi developing in pure culture on a medium of 4 per cent. malt extract and 2 per cent. agar were *Caudospora taleola* (Fr.) Starb., (?)*Dothidea noxia* (*Fusicoccum noxium*) [*R.A.M.*, xiv, p. 476], *Clithris quercina* (Pers.) Karst., and an apparently undescribed species of *Ophiostoma* [ibid., xv, p. 129]. Any one of these organisms may possibly be involved in the causation of the oak canker, but for the present the writer prefers to concentrate mainly on the last-named, which is described in detail. It is considered to fall within the *piceae-piliferum* group [ibid., xiv, p. 274] close to *O. fagi* and *O. quercus*, but it is identical with neither and for the present remains unnamed. A key supplemented by some explanatory comments, is given for the determination of the *Ophiostoma* (*Ceratostomella*) species so far recognized.

Evidence is adduced for the occurrence of heterothallism and intraperithecial aversion in cultures of the oak canker *Ophiostoma*. Extensive inoculation experiments were carried out both with the fungus under discussion and with *O. quercus*, the results of which, however, were inconclusive and point at most to a very limited degree of pathogenicity to the oak, neither probably being concerned in the initial production of the cankers. The early stages of the disease are, indeed, very difficult to trace, but a connexion is believed to exist between the black discoloration and death of the cambium underlying fresh wounds and the ultimate development of cankers. In an attempt to gauge the silvicultural importance of the oak canker it was ascertained that 167 out of a stand of 522 trees (32 per cent.) were attacked, the average diameter of the diseased stems being 3·46 cm. and that of the healthy ones 2·98 cm.

Crandall (B. S.). **Root disease of some conifers and hardwoods caused by Phytophthora cambivora (P. cinnamomi).**—*Plant Dis. Reptr*, xx, 13, pp. 202–204, 1936. [Mimeographed.]

Phytophthora cinnamomi regarded by the author as a synonym of *P. cambivora* has been found during the last four years causing root rot of

chestnuts [ibid., xv, pp. 378, 616] in South Carolina (*Castanea dentata*), Georgia (*C. dentata*, *C. mollissima*, and Paragon hybrid), Tennessee (*C. dentata*), Louisiana (*C. mollissima* and *C. japonica*), and Arkansas *C. ozarkensis*); of *Taxus cuspidata* and spruce (*Picea excelsa*) in Virginia; and of pines (*Pinus resinosa* [ibid., xiv, p. 409] and *P. sylvestris*), *Picea pungens*, larch, Japanese and English yews, walnuts (*Juglans nigra* and *J. regia*), birches (*Betula papyrifera* and *B. alba*), oaks (*Quercus borealis*, *Q. montana*, and *Q. alba*), plane (*Platanus orientalis*), and *Robinia pseudacacia* in Maryland. The *Phytophthora cinnamomi* rot is mostly of the dry type and is accompanied in conifers by resin deposition. Black walnuts and *R. pseudacacia* develop a soft rot often combined with tap-root disintegration. The irregular, wedge-shaped streaks of infected tissue are usually reddish-brown but in walnut they are black. The first sign of the disease in conifers is the gradual loss of colour in the needles, while in hardwoods the entire seedling wilts suddenly. In oriental planes a premature reddening of the leaves is characteristic of the disease. Inoculation experiments in the greenhouse gave positive results on *Pseudotsuga taxifolia*.

Alben (A. O.) & Boggs (H. M.). **Zinc content of soils in relation to Pecan rosette.**—*Soil Sci.*, xli, 5, pp. 329–332, 1936.

The results [which are discussed and tabulated] of soil analyses of pecan [*Carya pecan*] orchards in Texas and Louisiana showed the zinc content of the calcareous basic soils to be generally higher than that of sandy loam (acid) ones; the element, however, is apparently unavailable in the former, judging by the extensive occurrence of rosette [*R.A.M.*, xv, p. 543]. On soils with both acid and basic horizons the trees appear to be favourably influenced, as regards predisposition or otherwise to rosette, by the acid reaction. Soils having all acid horizons support pecan trees relatively free from rosette in the presence of a moderate quantity of zinc, indicating the availability of the latter. Acid soils containing minimum amounts of zinc produce trees with a tendency to rosette, showing that the element, though available, is insufficient in quantity to ensure a normal state of health.

Biberdieva (Mme M. P.). О бактериофаге **Bact. mori,** возбудителе бактериоза Шелковицы. [The bacteriophage of *Bact. mori*, the etiologic agent of Mulberry bacteriosis.]—*Микробиол.* [*Microbiol.*], v, 4, pp. 590–591, 1 fig., 1936. [English summary.]

A description is given of experiments on the behaviour of the bacteriophage of *Bacterium mori*, the agent of mulberry bacteriosis in the U.S.S.R. [*R.A.M.*, xiii, p. 15; xv, pp. 627, 633] towards the homologous organism in meat-peptone agar cultures, the results of which indicated that this phenomenon may be of great value in the work of identification.

Wagener (W. W.) & Mielke (J. L.). **First blister rust found in California.**—*Plant Dis. Reptr*, xx, 14, pp. 220–221, 1936. [Mimeographed.]

The authors report the first case of *Cronartium ribicola* [see next

abstract] found in California, on *Pinus lambertiana*, near Monumental, in the Siskiyou National Forest, about 1½ miles south of the California-Oregon line, in June, 1936. A further infection centre on *P. lambertiana* and *Ribes cruentum* was also found at Camp Victoria, Oregon, in the same forest.

Finlayson (E. H.). **Report of the Director of Forestry, 1935–6 (fiscal year ended March 31, 1936).**—Issued by Dep. of the Interior, Canada, 44 pp., 1936.

In experimental operations against white pine blister rust [*Cronartium ribicola*: see above, p. 7, and preceding abstract] carried out since 1933 in the Petawawa Forest Experiment Station Area, Canada, preliminary control treatment has been given so far to about 15 sq. miles of valuable forest. The cost of the work has averaged 15 to 20 cents an acre. The future of white pine in North America is now entirely dependent on adequate control measures being taken against the rust.

To ascertain whether the dissolved salts contained in considerable quantities in many lakes in the Prairie Provinces in Canada might be effective as wood preservatives, 14 railway sleepers were submerged in Lake Manitou for eight months and placed on the track in 1921; up to 1933 only one had to be removed on account of decay.

Analysis of the distribution of preservative salts in spruce [*Picea* spp.] poles treated by injecting zinc chloride mixed with flour and water into alternate holes 1 in. in diameter bored longitudinally in the sapwood at the butt, the adjacent holes being filled with sodium arsenite paste, showed a satisfactory distribution of zinc arsenite in sections 6 in. below the ground, provided sufficient holes were used. For a butt of 10 in. diameter 16 holes are required. The insoluble salt is precipitated by the fanning-out of the two soluble salts, which are carried up the sapwood by the flow of moisture induced by evaporation from the top of the pole. The best results were obtained on green poles with the bark left on up to the ground line.

In investigations on the distribution of preservative salts in treated wood after drying, pieces of yellow birch [*Betula lutea*] impregnated with solutions of zinc chloride and mono-ammonium phosphate showed a fairly uniform distribution of both substances immediately after impregnation, but after kiln-drying a drop in concentration from the surface to the centre was very noticeable, and was more pronounced in severe than mild drying.

In comparative laboratory tests two out of four chemicals efficiently controlled blue stain [*Ceratostomella* spp. and other fungi: *R.A.M.*, xv, pp. 69, 271], but none gave satisfactory control of mould. Analyses of pulpwood from blockwood piles at pulp mills showed that unbarked wood suffers greatly from decay in storage as compared with barked wood. One lot of unbarked spruce and balsam fir [*Abies balsamea*] after 3 years' storage contained less than 6 per cent. sound wood, whereas two lots of barked wood from a 4-year-old pile (spruce, balsam fir, and Jack pine [*Pinus banksiana*]) contained 69 and 31·8 per cent. sound wood, respectively.

Rouppert (K.). **Blasenrost der Arve in der Hohen Tatra.** [Blister rust of the Siberian Stone Pine in the High Tatra.]—*Bull. int. Acad. Cracovie*, Sér. B 1, 8–10, pp. 241–252, 3 pl., 1935. [Abs. in *Neuheiten PflSch.*, xxix, 5, p. 189, 1936.]

With the aecidiospores of the *Peridermium* stage (*P. strobi*) of *Cronartium ribicola* from a Siberian stone pine (*Pinus cembra* var. *sibirica*) in the High Tatra mountains (Carparthians), the writer successfully inoculated *Ribes nigrum*, *R. rubrum* var. *hispidulum*, *R. petraeum* vars. *carpathicum* and *litwinowii*, *R. himalayense*, and *R. wallichii*. On the basis of these studies the rust is considered to be a physiologic form of *C. ribicola* quite distinct from that attacking white pines [*P. strobus*: see preceding abstracts].

Day (W. R.) & Peace (T. R.). **Butt rot of conifers.**—*Scot. For. J.*, l, 1, pp. 52–54, 1936.

In this further note on conifer butt rot [*R.A.M.*, xiv, p. 803] the authors state that in addition to the fungi previously mentioned, *Hypholoma fasciculare* [ibid., xiii, p. 605] and *Coniophora cerebella* [*C. puteana*] may also be associated with the condition. Douglas fir [*Pseudotsuga taxifolia*], Sitka spruce [*Picea sitchensis*], Japanese larch [*Larix leptolepis*], *Thuja* sp., and Lawson's cypress [*Cupressus lawsoniana*] have been found seriously affected.

Miller (P. R.). **Morphological aspects of Gymnosporangium galls.**—*Phytopathology*, xxvi, 8, pp. 799–800, 1 fig., 1936.

In the course of extensive surveys made for the purpose of studying the galls formed on *Juniperus virginiana* by *Gymnosporangium juniperi-virginianae* [*R.A.M.*, xv, p. 662], the writer has observed a greater profusion of galls on awn-shaped than on scale-like leaves. The examination of stained material of both types indicated that the galls taken from trees with awn-shaped leaves are of foliar origin, while those derived from trees with scale-like leaves originate on the stems. Another point requiring elucidation was the mode of emergence of the gelatinous spore horns through the tough cortex of the stem. Analysis of sections of fresh material disclosed the presence of circular cortex caps, perceptible on the surface of the gall as slight, pit-like depressions, which are lifted and pushed aside by the emerging spore horns.

Waterman (Alma M.) & Miller (J. A.). **A die-back of Douglas Fir.**—*Phytopathology*, xxvi, 8, pp. 804–805, 1936.

A die-back of Douglas fir (*Pseudotsuga taxifolia*), *Pinus nigra*, *P. strobus*, and *Picea pungens* in Long Island was found to be associated with a species of *Sphaeropsis*, characterized by brown, unicellular pycnospores measuring 24 to 40 by 9 to 15 μ, but with a few hyaline unicellular and brown bicellular spores among them. Apparently a similar disease has been referred elsewhere to *Sphaeropsis ellisii* [*R.A.M.* xv, p. 412] or *Diplodia pinea* [ibid., xiv, p. 483]. Douglas firs are not known to have been hitherto reported as hosts of species of either of these two genera in the United States, but J. S. Boyce in 1930 found a canker on Douglas firs in California associated with a *Sphaeropsis* corresponding to the Long Island fungus.

York (H. H.), Wean (R. E.), & Childs (T. W.). **Some results of investigations on Polyporus schweinitzii Fr.**—*Science*, N.S., lxxxiv, 2172, pp. 160–161, 1936.

In July, 1928, northern white pine (*Pinus strobus*) trees at Norwich, New York, showed a resinosis of the root crown and roots, the same condition being noted a year later near lakes Hemlock and Canadice. From the summer of 1933 onwards sporophores of *Polyporus schweinitzii* [see above, p. 8] were observed near the base of dead and diseased trees, but hundreds of cultures from resinosed lesions failed to yield this species though a greyish-black fungus developed in approximately 75 per cent. There was no evidence of any direct connexion between the resinosis and *P. schweinitzii*. Resinosis was most severe where the P_H value of the soil was 6 or more, and the colloidal content not under 52 per cent. In such areas, *P. schweinitzii* was very abundant, but it also caused serious damage where the P_H value of the soil was about 5·5 and the colloidal content under 46.

In 1934, advanced root decay due to *P. schweinitzii* was widespread both in *P. strobus* and red pine [*P. resinosa*] in plantings near lake Hemlock totalling about 1,200 acres; not one tree is expected to reach marketable size, the losses being the most serious recorded in forest plantings in the United States, and perhaps in the world.

In the districts affected by *Polyporus schweinitzii* the top 4 in. of soil contain nearly 21 per cent. more calcium than in unaffected areas, while the wood from diseased trees contains less calcium than that of normal trees. This suggested that the fungus renders the calcium in the soil less available to the trees, and analyses of a water extract of silica quartz sand from the roots of 3-year-old eastern white pine [*Pinus strobus*] seedlings grown in pot cultures, inoculated with the fungus, and supplied with nutrient, showed 25 times more calcium than in the uninoculated controls.

Polyporus schweinitzii was highly parasitic on the roots of 1- and 3-year-old white pine seedlings, especially in pot cultures with nutrient solutions of P_H 6 and 7 and a reduced phosphorus supply. Reddish streaks were present in the centre of roots under 2 mm. in diameter. Many isolations showed a wide range of cultural reactions, some being homothallic and fruiting readily; no clamp-connexions were observed.

Münch (E.). **Das Lärchensterben.** [The die-back of Larches.]—*Forstwiss. Zbl.*, lviii, 14, pp. 469–494; 16, pp. 537–562; 17, pp. 581–590; 19, pp. 643–671, 15 figs., 1936.

The outcome of the author's extensive researches on the dying-off of larches, commonly associated in Germany with the cankers due to *Dasyscypha willkommii*, though apparently of independent origin, has already been noticed from another source [*R.A.M.*, xv, p. 131].

Kaufert (F.). **Heart rot of Balsam Fir in the Lake States with special reference to forest management.**—*Tech. Bull. Minn. agric. Exp. Sta.* 110, 27 pp., 5 figs., 5 graphs, 1935. [Received November, 1936.]

After pointing out that increasing use is being made of balsam fir

(*Abies balsamea*) as a pulp wood in the United States, the author describes his investigations on heart rot of this tree due to *Poria subacida* [*R.A.M.*, xiv, p. 805], *Polyporus balsameus* [ibid., ix, p. 148] (both causing butt rot), and *Stereum sanguinolentum* (causing red top rot) [see above, p. 7], based on an examination of over 1,100 trees from 19 plots in northern Minnesota and Wisconsin.

The present stands are over-mature. Decay, cull, and liability to wind-breakage considered, the pathologic rotation should be set at not over 80 years, while merchantable trees may be grown in 60 to 70 years. Fifty-nine per cent. of the trees examined were rotted and of these 70 per cent. had butt rot only, 23 per cent. butt and top rot, and 7 per cent. top rot only. The number of trees with butt rot increased rapidly with increasing age after 40 years, 80 per cent. of trees 90 to 100 years old being affected. The average amount of decay in all the trees was 16·5 per cent. of the total volume (38·1 per cent. of merchantable volume), 8·7 per cent. (17·7) being due to butt rot, and 7·8 per cent. (20·4) to top rot. Of 642 trees with butt rot 73·4 per cent. showed the yellow stringy rot due to *Poria subacida*, 17·1 per cent. brown cubical rot (*Polyporus balsameus*), 3·7 per cent. showed both, and 5·8 showed red top rot (*S. sanguinolentum*) spreading to the stump and causing butt rot. On a volumetric basis, the percentages of rot were 89, 5·7, 4·7, and 0·6, respectively. The butt rot organisms usually enter the trees through broken side or tap-roots, the top rot organism entering through branch stubs. A blue stain fungus was prevalent in over-mature trees.

Snell (W. H.) & Shipley (L. B.). **Creosotes—their toxicity, permanence and permanence of toxicity.**—*Proc. Amer. Wood Pres. Ass.*, xxxii, pp. 32–115, 28 graphs, 1936.

This is a highly technical account, supplemented by 19 tables, of the writers' laboratory investigations on the toxic efficiency and permanence of toxicity towards wood-destroying fungi (represented by *Fomes annosus*) [*R.A.M.*, xiii, pp. 70, 556; xiv, pp. 276, 807] of different types of creosotes and mixtures of a given creosote with known amounts of coal tar and petroleum.

The coefficient of permanence of toxicity was computed from the quantities of each material left and its toximetric value originally and at the close of varying periods of exposure. The resultant data indicated that materials with higher initial toxicities and correspondingly higher initial coefficients maintain their relatively advantageous position throughout the three months covered by the tests. The low-residue creosotes were found to excel the high-residue brands in respect of permanence of toxicity. The toxicity possessed by the various materials used was shown to reside exclusively in their content of the 0° to 355° C. coal tar fraction. Non-toxic substances, such as petroleum and the residue above 355° from coal tar, exert a blanketing effect on the toxicity of this 0° to 355° fraction in an almost direct ratio to their proportions in the mixtures. According to the results of these tests, high-residue creosotes may properly be regarded as mixtures of low-residue creosotes with relatively small amounts of excessively light

coal tar oils and large quantities of residue above 355° of coal tar materials. The very light coal tar oils contribute somewhat to the initial toxicity of the high-residue creosotes, which is lost, however, during the early periods of exposure, while the excessive amounts of residue above 355° not merely dilute the toxicity of the low-residue material but impair such value as it possesses by their blanketing action.

The conclusion reached as a result of these experiments is that the low-residue creosote (No. 1, typical of the grades in common use) serving throughout as a control compares very favourably with the other materials tested.

[This paper was followed by a somewhat critical discussion (pp. 115–133) in which E. Bateman, E. O. Rhodes, H. Schmitz, and F. E. Cislak took part.]

Bateman (E.) & Baechler (R. H.). **A calculation of the toxicity curve from solubility data.**—*Proc. Amer. Wood Pres. Ass.*, xxxii, pp. 136–145, 3 graphs, 1936.

Coal tar creosote deprived of tar acids gave approximately the same curve for the relationship between the percentage distilling below 270° C. and toxicity to *Fomes annosus* [see preceding and next abstracts] and *Trametes serialis* as naphthalene, chosen for these experiments as a representative of the toxic low-boiling hydrocarbons. It does not differ appreciably, moreover, from the relationship shown by the water-gas tar oils [*R.A.M.*, xv, p. 269] which have, in general, the same hydrocarbons as coal tar creosote but no tar acids. It is suggested, on the basis of the experimental data here presented, that the wood-protective action of coal tar creosote might be duplicated by other combinations of low-boiling toxic hydrocarbons, high-boiling non-toxic hydrocarbons, and high-boiling phenols.

Schmitz (H.). **The influence of the character of the petroleum on the initial toxicity to wood destroying fungi of creosote-petroleum mixtures.**—*Proc. Amer. Wood Pres. Ass.*, xxxii, pp. 145–158, 3 graphs, 1936.

It would appear from the writer's experiments, using the standard Petri dish method, with *Fomes annosus* and *Trametes serialis* [see preceding abstracts], that the initial toxicity of creosote-petroleum mixtures [*R.A.M.*, xiv, p. 667; xv, p. 269] is influenced by the character of the petroleum as well as by the fungicidal activity of the creosote. Petroleum mixtures of high specific gravity seem to be less toxic than those of low specific gravity. The specific gravity of the three samples used in these tests varied inversely with the residue above 355° C. and directly with the amount of the sample distilling below that point. In other words, petroleum mixtures with a relatively low fraction below and a relatively high residue above 355° were more toxic than those with a relatively high fraction below and a relatively low residue above 355°.

[This paper was followed by a discussion by H. B. Carpenter, N. E. Kittell, and R. M. Alpen.]

Arnold (W. P.) & Boller (E. R.). **Clean treatments.**—*Proc. Amer. Wood Pres. Ass.*, xxxii, pp. 390–411, 4 figs., 6 graphs, 1936.

The principal 'clean' treatments of wood (i.e., those which do not appreciably alter the appearance and other superficial characters of the original material) at present in use in the United States are those carried out with aqueous salts or creosote. In the case of the former the wood should be kiln-dried or seasoned after treatment and the moisture content reduced to a value corresponding to the future conditions of use. The toxicity of various salts towards *Lentinus lepideus*, *Lenzites sepiaria*, and *Coniophora cerebella* [*C. puteana*] was tested by the standardized wood-block [*R.A.M.*, xv, p. 621] and small sapling (outdoor) methods [ibid., xiv, p. 276], the latter being generally more satisfactory; southern yellow pine [*Pinus palustris*] was used in both series. The most generally promising of the salts was a combination of sodium bichromate and zinc chloride (1:5) [ibid., xv, p. 414], though in the laboratory tests *C. puteana* was better controlled by a fluoride-arsenate-chromate phenol mixture.

Most of the objections raised to creosote treatments are based on the tendency to 'bleeding' of wood thus handled [ibid., xv, p. 623], especially in the case of outdoor installations treated by the full-cell process; suggestions for overcoming this defect include the adoption of the empty-cell process combined with the minimum retention of creosote compatible with satisfactory penetration.

Regulations made under the Importation of Plants Regulation Ordinance, 1935. No. 4 of 1936.—6 pp., 1936.

Under the Importation of Plants Regulations, 1936, effective as from 1st February, 1936, and applicable to the Colony and Protectorate of Nigeria (including the Cameroons under British Mandate), the importation of the following is prohibited: all plants in soil other than special rooting compost; all cacao plants from Central and South America and the West Indies; all plants other than cacao from countries known to harbour witches' broom disease [*Marasmius perniciosus*: *R.A.M.*, x, p. 144; xv, p. 561] as specified by notice in the *Gazette*; all coco-nuts in husk from Central and South America and the West Indies; all coffee cherry unless certified free from mealy pod disease [*Trachysphaera fructigena*: ibid., xv, p. 153]; and all cotton seed unless free from lint. Any plant or seed, except seeds, bulbs, tubers, or corms of vegetables or ornamental plants from temperate countries, or dry, hulled rice, coffee, or pulses for consumption, is liable to inspection, and treatment or destruction if necessary. Subject to the provisions of these regulations, the importation of cacao, cotton, cassava, and *Musa* (all species) plants and seeds, oil palm and citrus (all species) plants (not seed) shall be permitted from West African countries included in the Plant Interchange Schedule only under permit signed by the Director of Agriculture, which is not required, however, in the case of plants and seeds of coco-nuts, kola [*Cola acuminata*], coffee, groundnuts, yams, rice, pulses, guinea corn [sorghum], millets, maize, and rubber [*Hevea brasiliensis*]. Importation of the latter group from other countries requires certification (except for articles for consumption).

Summaries of Colonial rules for importation of plants.—*Agric. Live-Stk India*, vi, 4, pp. 548–595, 1936.

Summaries of plant import legislation in force as at 31st December 1934 are given in the following Colonies and Dependencies: Gold Coast, Nigeria, Gambia, Nyasaland [see next abstract], Dominica, Cyprus, Kenya, Montserrat, Zanzibar, Barbados, St. Kitts-Nevis, Trinidad and Tobago, St. Lucia, Southern Rhodesia, Northern Rhodesia, Uganda, Ceylon, Jamaica, British Solomon Islands, St. Vincent, Mauritius, Tonga, Antigua, Sierra Leone, Palestine, Maltese Islands and Gilbert and Ellis Islands, together with more recent regulations for Nigeria [see preceding abstract].

Proclamations Nos. 10 and 11 of 1936.—*Nyasald Govt Gaz., Suppl.*, 2 pp., 31st August, 1936.

Proclamation No. 10 of 1936 (made under the Nyasaland Plant Pests and Diseases Ordinance [of 1924, *R.A.M.*, iv, p. 255]) permits the importation of rose plants into Nyasaland from Australia, Canada, or the United States only if officially certified in the exporting country as free from any virus disease. Proclamation No. 11 of 1936 prohibits the importation from any countries except the Union of South Africa, Southern Rhodesia, Northern Rhodesia, and the Belgian Congo of eucalyptus, acacia, oak, and plane plants or parts thereof, except seed and manufactured products; live peach stones; fresh stone fruits; fresh citrus fruits and dried (but not candied) citrus peel; elm and chestnut seeds and plants; any plant packed in soil other than special rooting compost; apples, pears, quinces, and loquats; and unmanufactured broom corn [*Sorghum vulgare*] unless the crowns are cut away or crushed.

British Guiana. Orders in Council Nos. 551 and 552 of 2nd April 1936.—*Official Gazette*, 11th April, 1936.

Order No. 551 prohibits the importation into British Guiana of sugarcane, grasses, soil, and, except with the written authorization of the Director of Agriculture, banana and plantain suckers [cf. *R.A.M.*, xv, p. 464]. Order No. 552 enacts that all other living plants, and parts thereof intended for propagation, are subject to examination by an inspector who may demand the certificate of health provided by the country of export.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 9, pp. 202–204, 1936.

Turkey. Under a Law passed on 29th January and effective as from 5th February, 1936, all plant consignments imported into Turkey must be accompanied by duly authenticated certificates of health and origin. A list of the diseases and pests to be excluded will be supplied by the Ministry of Agriculture to the countries interested. Certificates for the export of plants will be granted only when the merchandise complies with the requirements of the importing country. Provision is also made for internal phytosanitary administration, and the importation, production, and sale of plant protectives are placed under the control of the Ministry of Agriculture.